THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

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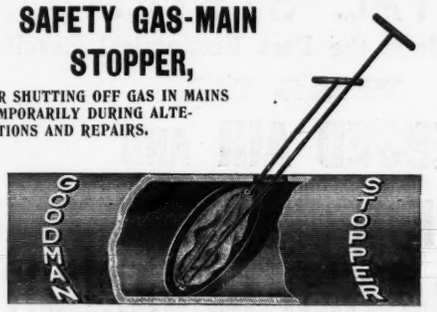

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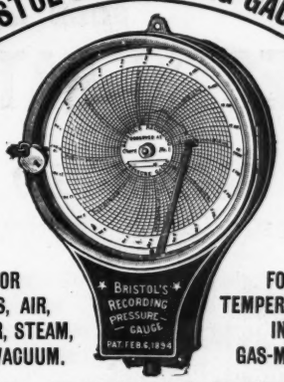

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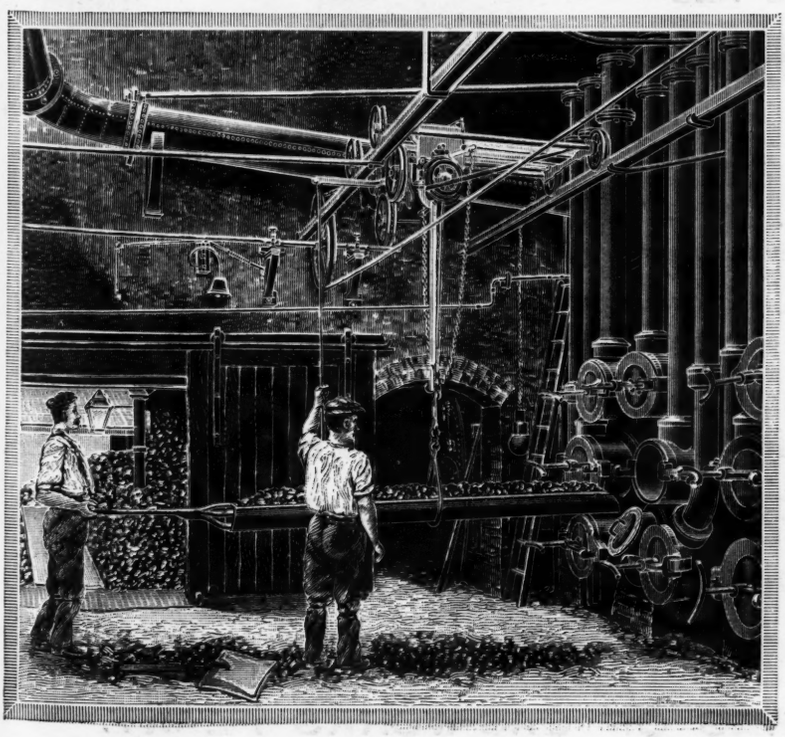

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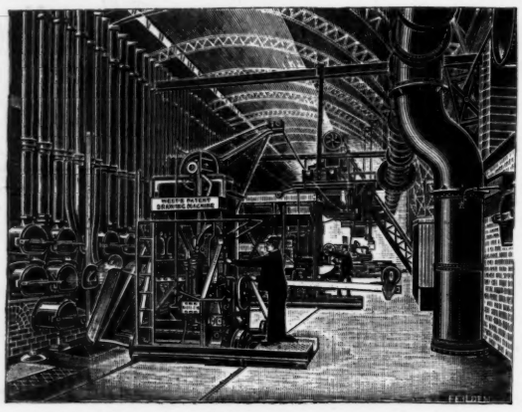

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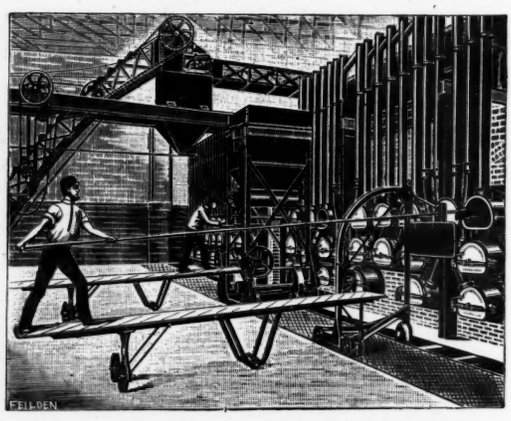

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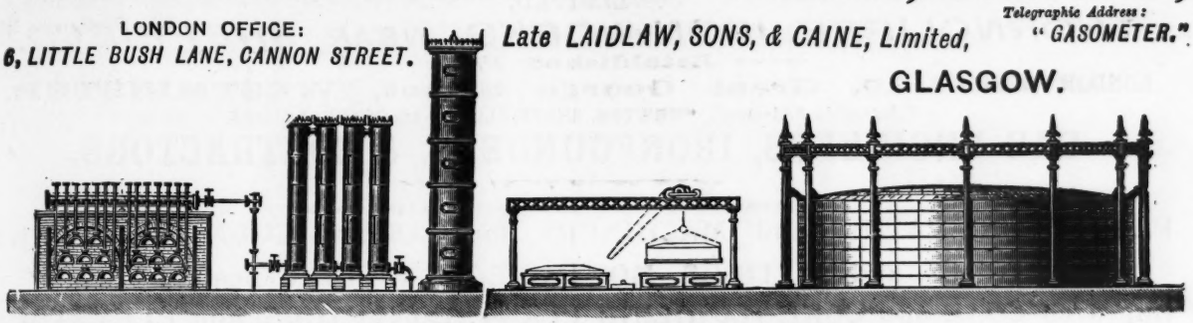

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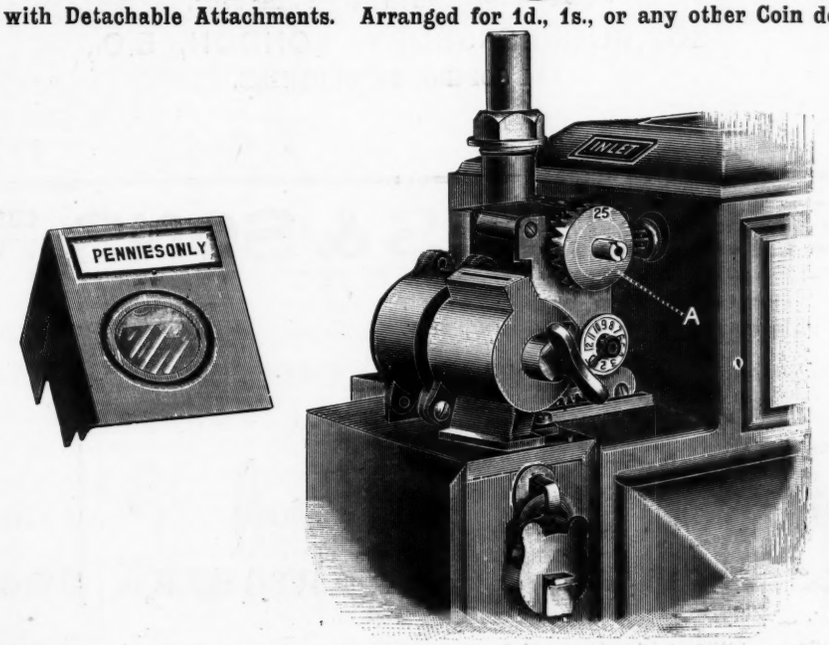

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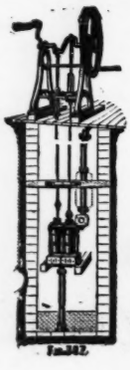

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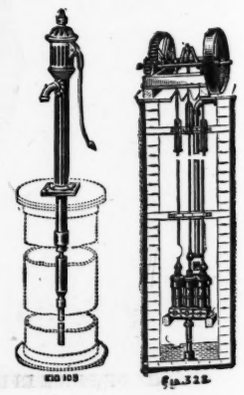

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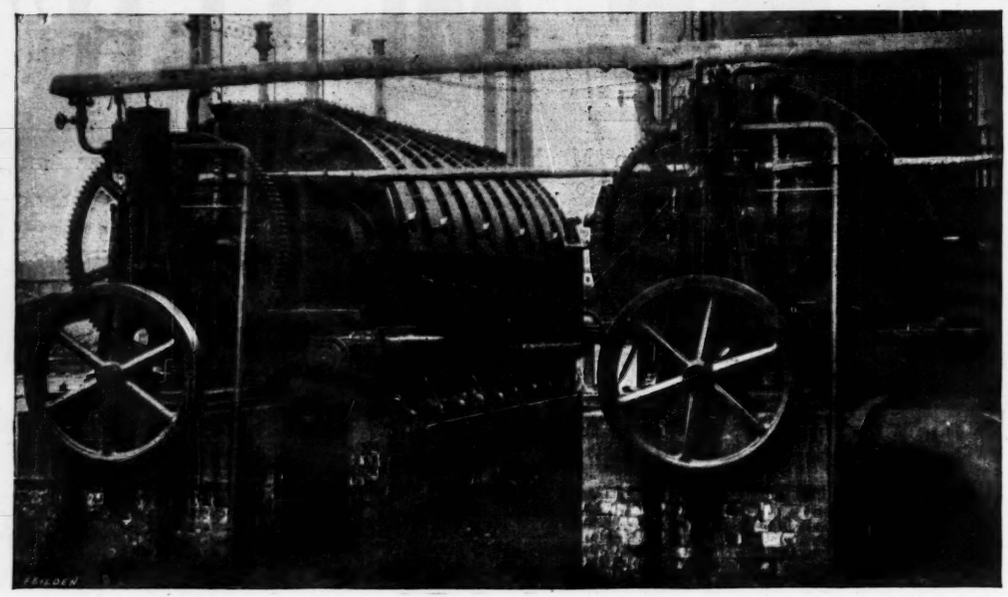

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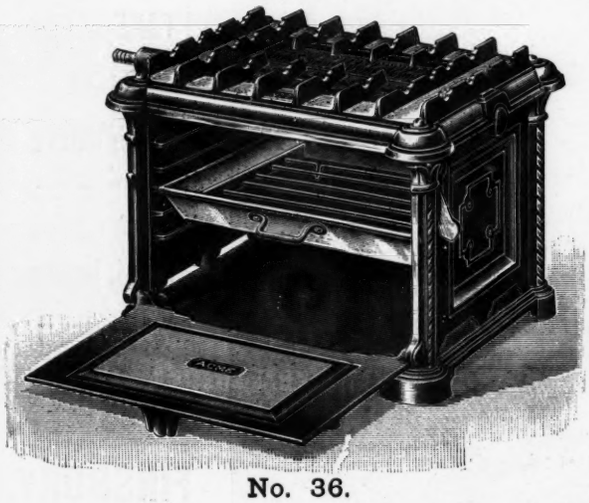

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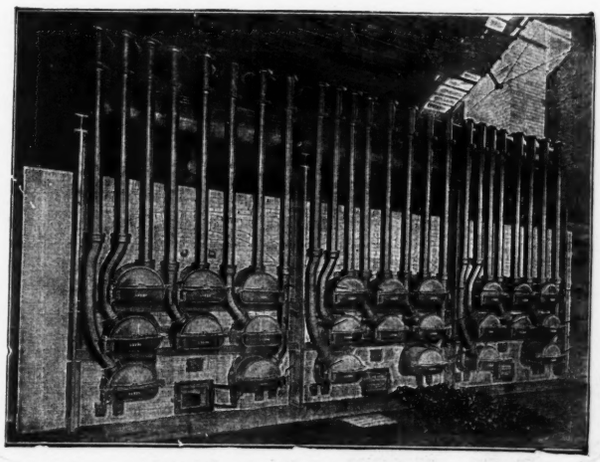

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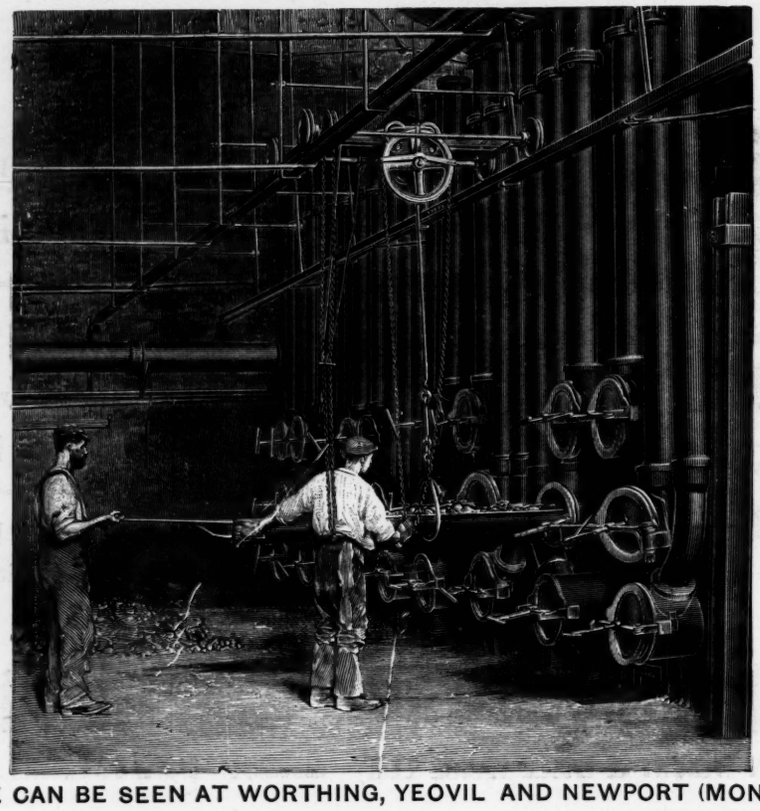

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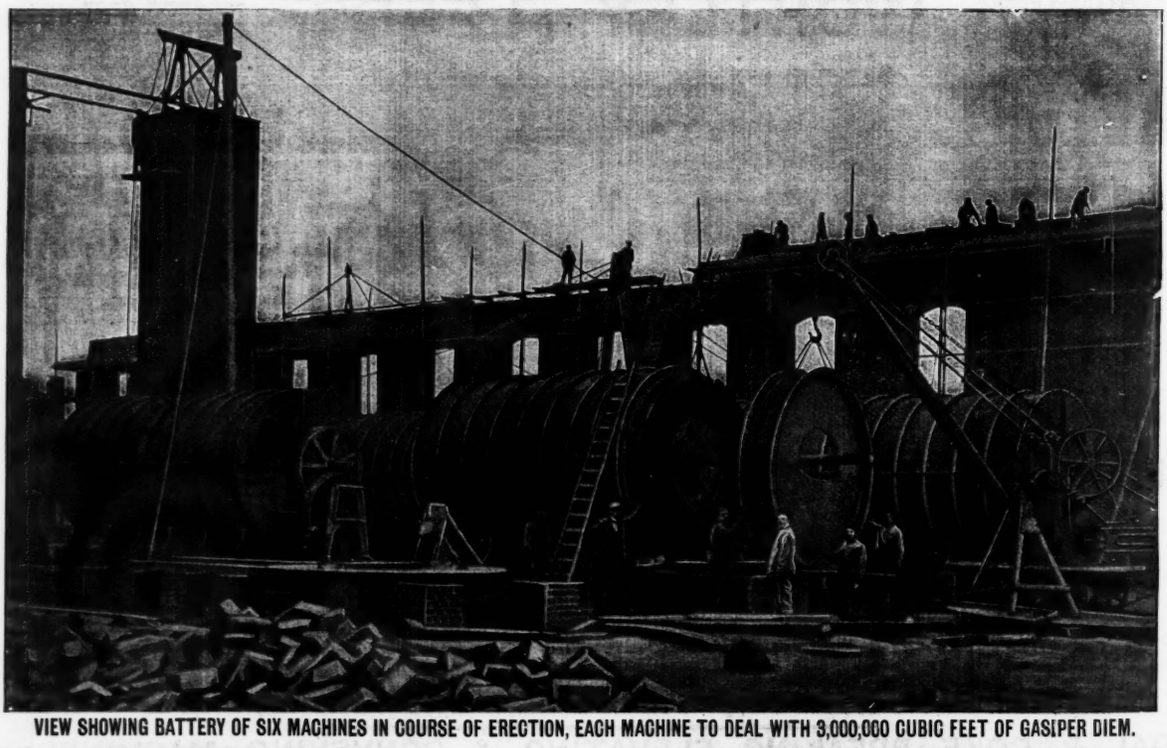

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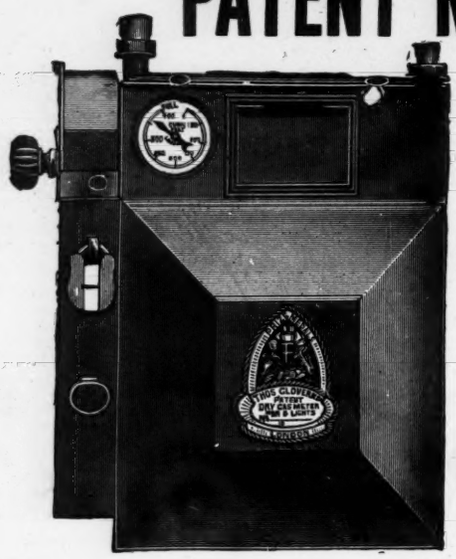

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JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

VOL. LXXVIII., No. 1992.—TUESDAY, JULY 16, 1901.

EDITORIAL NOTES.

The South Metropolitan, Mond, and Golborne Gas Bills in the House of Lords.

THE House of Lords last week vindicated once more their character for despatch in the transaction of Private Bill business. The South Metropolitan Bill came before a Committee of their Lordships, presided over by Lord Falkland. There was a formidable opposition; and again Mr. Livesey was the only witness for the Company. On the second day of the hearing, the Committee declared the preamble of the Bill proved, striking out the second proviso of the amended transfer clause, which directed that any increased revenue received by the Gaslight and Coke Company for public lighting by reason of the dissolution of the Nine Elms settlement, should be applied to a reduction of the price of gas supplied to the private consumer. Practically, therefore, the South Metropolitan Company got all they wanted; while the Gaslight and Coke Company are certainly not placed in a more disadvantageous position than they previously occupied in regard to their next Bill.

Another Committee, presided over by Lord Hatherton, accepted the preamble of the Mond Gas Bill, the opposition of the local authorities having shrunk to a single petition —Walsall, who fought to the last for exclusion. The promoters are to be complimented upon their success, which is all the more remarkable as it has no financial or technical justification. They profited by the reluctance of Parliament to say "No!" to an industrial project supported by many eminent persons in and out of Parliament, and only confronted by what looked like the interested opposition of a group of gas-supplying local authorities and local gas companies. Of course, Mr. Balfour Browne, K.C., made out a plausible case for the preamble; but it is not a little remarkable that not one of his witnesses could lay claim to have any practical knowledge of the sort of business which the Company propose to engage in. All the vague generalities were on the side of the promoters; while all the hard matters of detail and of fact were on the other side. Still, for the reason already stated, and also probably because this Parliament is not in love with trading municipalities, the Mond Company of South Staffordshire obtained their Bill. Counsel told the Committee that in the district affected by the Bill "the cost of ordinary coal gas was about 2s. per 1000 "cubic feet. . . . Mond gas could be produced and "sold at 2d. per 1000 cubic feet. Although manufac- "turers would have to burn four times as much Mond gas "as they would of ordinary gas to produce the same result, "it was clear that the relative prices of the gases stood as "2s. to 8d." He appeared to let it be understood that this comparison of prices would always hold good.

What will happen in the district will probably be very different. The local authorities, who have hitherto worked their gas undertakings as though they were absolute monopolies, will reconsider the position in the light of sanctioned competition. The rate funds will not get any more subsidies out of artificially inflated gas "profits." Even Birmingham, with competition at its gates, will be constrained to take a thought for the future, of a nature which the Corporation never dreamt of considering. Those local government districts in which the Mond Company will later establish their stations, as Tipton and Smethwick, will hope to find in the assessment of this property some compensation for any loss that may come upon their gas undertakings. Everywhere, the selling price of ordinary coal gas will be put upon a competitive basis. Gas Companies—at Wolverhampton, Dudley, and elsewhere—cannot move far in this direction; and we are sadly afraid that this affair will depreciate their property without bringing to the public any countervailing benefit. They must be content to wait, and watch. It is difficult to see where the market for Mond gas is to be found. All the talk about the possible local industrial uses of this kind of fuel is so much wind. Will Mond gas ever bake a loaf of bakers' bread—at one end of the scale of consumption —or burn a single blue-brick, at the other? Nobody with a scrap of commercial knowledge of the gas business, or with competent experience of the working of gas-furnaces, believes in the possibility of either result. What will happen will be that certain manufacturers in the area in question, who would use gas in their works, at a price, yet do not need enough to make it worth their while to manufacture it for themselves, will be able to buy ordinary gas at a considerable reduction on former prices. The figure of 1s. per 1000 cubic feet for this class of business has been named; and probably contractors for long periods, taking most of the supply in the daytime, could be served at this price without actual loss to the proprietors of the gas-works. This would put a different aspect upon Mond gas prospects.

The other significant business done by the House of Lords was the confirmation of the policy of the House of Commons Committee in regard to the case of the Leigh Corporation and the Golborne Gas Company. It is unnecessary to repeat the particulars of this matter, which is happily of an unusual character. The Leigh Corporation, stigmatized as "filibusters" in the Lower House, are given three months to clear out of Golborne, without getting a single penny towards the expenses of the operation. The ratepayers are to pay the costs—not the consumers of Leigh gas. It is impossible to avoid the reflection that it is such performances as this of the Leigh Corporation which have caused the out-and-out partisans of municipal trading monopolies to stand badly in the estimation of Parliament. It appears to be very difficult for municipal traders to realize that they must carry on their business like other people. They make a great parade of the iniquity of any of the ordinary conditions of trade which, in their judgment, threaten the interest of the ratepayers committed to a commercial undertaking, but forget that the proper rejoinder to this plea is that all such risks should be considered before the rates are exposed to them.

A Notable Victory for Coal Buyers.

THE bloom is fast coming off the rye for the coalowners. For some weeks past, a quiet struggle has been proceeding between them and the railway companies over the price to be paid by the latter for their engine fuel from the beginning of this month. At this time last year, the coalowners were able to exact from the railways 16s. a ton for six months' supplies. At the end of that period, the collieries offered a concession of 1s. per ton, but had to sell at about 13s. 6d.; and at that price the wisest among the railways declined to buy more than three months' requirements. When the companies came again into the market, the Yorkshire collieries asked from 10s. to 10s. 6d. per ton, but, in consequence of the competition of Derbyshire coal, were obliged to close contracts for the three months ending June at 9s. per ton—Derbyshire owners accepting 8s. 6d., much against their will and to the great disgust of the miners, who appear to think that the collieries ought to be able to get any price they may ask. Almost as soon as these contracts had been settled, the export trade—which had drooped considerably in the early part of the year—revived, under the combined influences of lower freights and the Budget; the imposition of the coal-tax just at the opening of the Baltic season causing buyers to press for, and sellers to expedite, delivery in order to be sure of coming within the promised exemptions. So that, whereas during the first quarter of the year the foreign sales of coal had fallen off by 950,000 tons, the following two months saw an increase in shipments of over 300,000 tons. Consequently, the coal market showed signs of renewed activity, which, while they did not deceive careful observers, awakened in the hearts of the colliery proprietors who had sold to the railways at 9s. a ton or less, regret that they had yielded so much, and a determination not to repeat the mistake.

It was, therefore, confidently announced that the 9s. had only been conceded at a moment when the market was temporarily demoralized, and that the collieries could not think of renewing the contracts at so low a figure—nothing less than 10s. per ton would be accepted for future supplies. The railway companies, following the lead of the Midland Railway (who, as one of the trade papers plaintively remarks, "have during the past year shown themselves very

"difficult to please in the matter of price"—we wonder what buyer has been "pleased in the matter of price" during the past year), having once reached as low a figure as 9s. a ton, did not show any disposition to fall in with the views of the colliery proprietors. For some weeks past, therefore, like the goats on the narrow path, the companies and the collieries have stood facing one another, both declining to yield. At length, however, the colliery goat has decided to let the railway goat "walk over"—not, as in the fable, for the sake of peace, but of necessity. In plain English, the railways have not only been able to buy coal at a maximum of 9s. per ton—some contracts have been arranged in Derbyshire at 8s. 3d. and 8s. 6d., and in West Yorkshire at 8s. 6d., while Lancashire collieries that stood out for 9s. have been passed over—but they have obtained at those prices contracts for a full year's supplies. That is to say, during the twelve months now beginning, the railway companies will be paying for their fuel only a few pence per ton more than before the "crisis" began in 1899, with the consequent result that manufacturing fuel will almost certainly be found at an equally lowered level.

If anyone wishes to discover what factor in the situation has so decisively moved the scale in favour of the buyer, let him look at the Board of Trade returns for the month of June. He will learn therefrom that the shipments of coal to foreign countries during that period were only 3,714,134 tons, compared with 4,169,724 tons in June, 1900. Allowing for the fact that June this year contained only 25 working days, against 26 last year, the falling off in foreign sales was over 7 per cent., which, if maintained throughout the current half year, would mean a reduction in exports of about 1,500,000 tons. Moreover, last month, as has been the case throughout the past half year, the exports of iron and steel show a marked decline from the 1900 returns, though the falling off is not proportionately so heavy as in the March quarter, which compared with the most active period of the "boom." The total shipments of iron and steel in June amounted to 288,573 tons, against 333,762 and 324,944 tons in 1900 and 1899 respectively. The figures for the half year are very striking. This year, 1,450,250 tons; last year, 1,992,973 tons; 1899, 1,686,435 tons. In fact, we have to go back to 1895 to find such a poor half year; while the annual total shipments have only fallen below 2,800,000 tons twice in the past 16 years, and only four times below 3,000,000 tons. The set-back in our foreign trade in iron and steel is, it will be seen, no small matter.

The victory of the railway companies, which may be said to certify publicly the complete disappearance of the coal "boom," is most satisfactory to all coal users—not least to the gas industry—and affords complete justification for those of us who for twelve months past have been advocating with all our might a policy of caution and non-commitment. We would now merely remark that it would be unwise on the part of coal consumers to forget that the fall that has already taken place, material and pleasing as it is, has not brought prices down to bottom figures. Coal should be cheaper yet; and so, we may add, will coke be. The time for the making of fresh contracts in London is drawing near. We do not wish to prejudice the situation, however slightly, by stating our idea as to the price the condition of the market would justify, so will leave the subject with the hope that the mistakes of a few years back will not be repeated.

The "Builder" on Water and Coal Gas for Incandescent Lighting.

THERE is a writer in our valued contemporary the "Builder" who usually criticizes gas topics with all the requisite knowledge and much acumen. In commenting upon the proceedings of the Gas Institute at the recent meeting, however, this critic offered some remarks upon the relation between the calorific power of lighting gas and its duty in an incandescent burner which appear to be open to question. He stated, to begin with, that experiments made by the President at Birkenhead "confirmed the statement that the duty "(in lighting power) per cubic foot of gas consumed in "incandescent burners is dependent upon the calorific power "of the gas. This statement," the writer goes on to remark, "is commonly accepted in this country as correct; but we "should like to know how British gas engineers explain the "claims of Dr. Strache, of Vienna, that plain, non-luminous "water gas made by his process, having a much lower "calorific value than coal gas, and consumed in burners "without admission of air before the point of ignition, is "giving as high a lighting value per cubic foot of gas consumed as is obtained from ordinary coal gas." It is always possible to glean news away from home; and possibly, in the mass of water-gas literature which appears from time to time in the "JOURNAL," we may overlook some items of interest, such as this. But a more explicit reference to the statement would be greatly appreciated by us.

Frankly speaking, for the moment, we do not recall it as being an uncontested verity. Besides, the "Builder" seems to be labouring under some misconception in regard to the prevailing technical opinion in England respecting the connection between the high calorific power of a gas and its luminosity in the Welsbach burner. This connection is real enough, and is therefore generally admitted; but the true point, that is more regarded, is the discovery that the calorific power of gas may be considerably reduced without affecting its lighting duty in the incandescent burner to any appreciable extent. And inasmuch as a high calorific power gas means a costly gas, the popular question is whether it is worth the money. We quite agree with our contemporary that "extensive investigation is yet required of the "relationship between light and heat in the Welsbach "system." There is another potent factor in the problem of the best and cheapest gas for incandescent lighting—flame temperature. This is what Dr. Strache must have had in mind, or in hand, when he made his straight water gas beat average coal gas in an incandescent mantle. If this was ever done, it must have been a calculated result; or no water gas that gas engineers in general have ever seen, burnt at the rate of 3 cubic feet per hour or less, could ever do the work of common coal gas at the same rate of consumption. The flame is too short to fill a mantle large enough to yield the light. Obviously, if things are going to be different in this respect—if straight water gas, costing 3d. per 1000 cubic feet in the holder, with its 300 units of calorific power per cubic foot, is to beat coal gas of twice the calorific power at its own special virtue of incandescent lighting—then the gas industry of the whole world has entered upon a fresh phase. Only, it is necessary to be sure of the fact before moralizing upon it.

Report of the Chief Inspector under the Alkali Works Acts.

THE annual reports of the Chief Inspector of the Alkali, &c., Works of the United Kingdom, are always welcome. They constitute an invaluable record of the progress of the national industry in a most important field of enterprise; and one could wish that the writers of newspaper articles upon the trade of England would pay more attention to the facts which Mr. R. Forbes Carpenter and his colleagues could tell them. In another column will be found the first of the articles in which we usually summarize the information contained in these publications. It is a curious illustration of the transitory nature of chemical industries that the number of alkali works, strictly so called, has sunk to 85 out of the total number of 1054 works which come under the supervision of the Inspectors. Yet the changes of the chemical industry are slow. As year follows year, the numbers of scheduled works carrying on a particular process grow or diminish by units; but still the movement is positive. It is influenced wholly by economical considerations. We cannot find any evidence that over-government, or any similar depressing influence, troubles chemical manufacturers at all. On the other hand, there is an equal absence of indication that the legal powers of the Inspectors for suppressing nuisances in connection with the operation of chemical works could safely be dispensed with. Although in most chemical industries nuisances are a sign of waste, it is anything but safe to rely upon the knowledge of this truth on the part of the manufacturers to prevent the perpetration of nuisances.

The exportation of British sulphate of ammonia continues to increase, as compared with the home consumption, which is certainly a matter for the Sulphate of Ammonia Committee to investigate. The Chief Inspector speaks well, and definitely, of the advantages of the Claus sulphur-recovery process in connection with the working up of ammoniacal liquor for sulphate. Both he and Mr. Sutton have some important observations to make on points of detail arising out of sulphate manufacture. The names of Mr. Curphey, Mr. A. M'Dougall, and Mr. H. Hemingway are mentioned in this connection. Although the production of sulphate of ammonia from gas-works still constitutes the great bulk of the output of this country, that from coke-ovens is said to be rapidly growing, especially during the last two years. Of course, the Chief Inspector mentions

the Mond Gas Scheme in this connection. It appears from this report that a new variety of ammoniacal liquor has appeared on the industrial horizon. This is the bye-product of the manufacture of producer gases, and seems to differ from gas liquor chiefly in containing almost the whole of its ammonia in the fixed state. The report contains the record of a mass of important work on ammoniacal liquors in general.

That the profitable recovery of ammonia from the nitrogen of coal, determined by analysis, is not always a certainty, is pointed out by the Chief Inspector, in his narrative of what happened "at an iron-work in the Midlands," where ammonia recovery plant of a type existing in many of the Scotch iron-works was put down. After all, the ammonia came off from the furnaces largely as ammonium chloride—a salt difficult to arrest with completeness when existing in a finely-divided solid state, and travelling in a current of gases giving enormous dilution. Moreover, the yield of ammonia in any shape was disappointing. Whether it had been formed, or whether it was destroyed before it could be recovered, was never ascertained; but the works were taken off the register. This discussion occurs in a highly instructive part of the report dealing with the existence of hydrochloric acid in ordinary coal smoke. Incidentally, it is disclosed that the catch-penny nostrums often offered for sale for checking black smoke in domestic chimneys are merely coarse salt coloured by some cheap pigment.

A Dissatisfied Electricity Consumer.

THERE is at least one householder and shopkeeper in the highly Progressive region of Poplar who is dissatisfied with the electricity supply as managed in his name, as ratepayer, by the Electricity Department of the borough. His name is Henry Dodd, baker, and he was summoned last Friday before the Magistrate at the Thames Police Court for £4 2s. 6d., being the amount of his alleged indebtedness to the Council for electricity supplied and hire of fittings. It was stated that the charge had been made out upon the basis of 5d. per unit for the first hour, 4d. for the second hour, and 3d. for all used after. Defendant had also agreed to pay ¾d. per unit for the fittings. In answer, the defendant said he was induced to sign the agreement by one of the Corporation canvassers, who made false statements—among others that the light would be as cheap as gas, "whereas "it cost three times as much." He also objected to the arrangement whereby the more electricity he consumed, the more he had to pay for the fittings. This baker must be a stupid person, to be thus blind to the beauties of both the "maximum demand indicator" of electricity consumed, and also of "free wiring." He declared that men were always calling to inspect the meter—three of them in two days; and he scouted the whole system as a costly nuisance. "He "would take good care he would have no more electric "lighting in his house." Besides, the light went out twice, and nearly spoilt all his bread! The case highly diverted the Court, on account of the outspokenness of defendant in respect of the luxury with which the Local Authority have endowed the district. Such are the rewards of Progressive virtue! However, an agreement is an agreement; and there was not sufficient ground in the baker's complaint to warrant him in refusing to pay the charges of the Borough Electricity Department. Order for the amount claimed, with 2s. costs. There will be plenty of trouble of the same kind in Poplar, when the people come to test the promises of the electric light canvassers by the bills delivered. The Commercial Gas Company will probably have more friends in the district than they ever suspected.

A Strike for "Recognition" in the United States.

THERE is news from the United States of a big strike of steel workers, which some of the English newspapers that have been groaning of late over the prospects of British trade would do well to notice very particularly. It is part of the now familiar jeremiad over the failing fortunes of our great national industries, that the British workman is more given to strikes than his American cousin. Remembering the American record in this regard, we have never been able to take this unfavourable view of the British workman, as a striker. He does strike, as everybody knows, unnecessarily often and on insufficient grounds; and much inconvenience results therefrom to those who want work done. But he is far from being singular in this respect. Yesterday's papers contained the news that the whole of the Trade Union hands in the employ of the Steel Trust are either on strike or are going out, on the question, familiar enough in England, of the "recognition of the Union." If this is a correct report, then it may be considered that the American steel trade is confronted with a labour trouble of the first order of magnitude, such as that which agitated the British engineering industry a short time ago. The two strikes, indeed, are apparently on identical lines, and are for the same principle, which cannot be settled in terms of money. "The employers think it enough to regard membership of "the Unions as a matter of individual discretion, free from "control by employers; the Unions being allowed every "facility for their propaganda." That is the same old story, which has been told of the employers in all trades afflicted with the curse of militant Trade Unionism. We have had it repeated in this country over and over again. Experience proves that this ostentation of indifference on the part of employers as to their workpeople being Trade Unionists or not, never weighs with the Union leaders for one instant when they feel strong enough to try who is master.

Sooner or later, all Trade Unionism of the militant variety—and most of it is of this brand nowadays—ventures upon a trial of strength with the employers over the question of the recognition (meaning the supremacy) of the Union. This is what appears to be happening now in the United States. If the employers stand out, as they very probably will, the American manufacturers of sheet and plate steel, tin plate, hoops, tubes, rails, and structural steel are likely to be more or less interrupted for a considerable period. The strikers are high stomached, having had a long spell of full work at good wages. Once more it is seen that such wages will not make workmen contented. As usual, the Trade Unions neither contain the majority nor the best of the workmen. The leading hands, who stand outside these Societies, earn more than the Union rates of wages—which is an offence. Consequently, the strike is directed against them as much as against their employers. On Saturday, the President of the Amalgamated Union ordered about 80,000 men to consider themselves on strike. What the employers will do in face of this autocratic action remains to be seen. It will, indeed, be wonderful if the outbreak is met without bloodshed.

WATER AFFAIRS.

British Association of Water-Works Engineers.

To those members of this Association who were able to be at Birkenhead last week, the annual meeting of 1901 will be borne in memory with mixed feelings—gladness, instruction, and interest being alternated by keen regrets. In the first place, their President, Mr. W. A. Richardson, M.Inst.C.E., who is one of the elders of the Association in years and professional experience, and who consequently occupies a high place in the affections and respect of his colleagues, has recently undergone a spell of physical suffering, and at one time it was feared he would be unable to preside at the meetings. The members rejoiced when they found that he had so far recovered as to be able to occupy his place in their midst, though only to take a modest part in the proceedings. It was a small matter to them that he did not address them at any length, so long as they had his presence. But a misfortune (which will never be remembered without sorrow by the members who witnessed it) came upon them and the town on Wednesday night, which submerged all in a sudden gloom, and marred the Association's meeting during the remainder of the week. That was the destruction of portions of the Town Hall (of which building Birkenhead is justly proud) by a fire which originated during the time the members were assembled therein for their annual dinner. The circumstances are fully narrated elsewhere, and need not be repeated here. But we unite ourselves very sincerely with the resolution of sympathy which was passed by the Association the following day. It seems a cruel fate which dealt such an odious blow on a Corporation and town during a week in which they had so graciously and with such open-handed liberality entertained a body of men who were no more than strangers within their gates.

But we are unwilling to dwell upon these matters, and turn with relief to more genial subjects. Owing to his illness, the President had been unable to prepare an address which met with his own approval; and the circumstances prohibit any criticism of the production from the points of view of composition or style. It consisted almost entirely of notes on the Birkenhead Corporation Water-Works; but

nevertheless it is a useful compilation, inasmuch as it gives some interesting facts as to wells and their yields in important parts of Cheshire and Lancashire, which are to a very great extent dependent upon water pumped from the new red sandstone. Consequently, the works visited were all of the pumping order; and by the time the end of the week came, the members who had followed the programme through must have felt they had been surfeited with information concerning, and inspections of, works of this particular character. But at the same time there was variation; some of the works being under construction, and others containing plant both ancient and modern.

Respecting the other technical matters placed before the members, the lecture by Mr. W. E. Plummer was extremely interesting; but we hope we shall not be accused of captiousness in saying that it would have been even more so had it been compressed into a narrower compass. In its main parts, the paper by Mr. William Watts on "Detecting and "Preventing the Pollution of Water Supplies" did not allow of comment, as the author's views are those which are generally accepted; but on minor points there were differences of opinion, on which many members recorded their ideas. Mr. W. Ingham's paper on "The Design, Con- "struction, and Cost of Service Reservoirs," was read; and then came the collapse in the technical proceedings owing to the catastrophe of Wednesday night. This caused the postponement of the discussion; but the admirable paper will not suffer, as it is one which requires a great deal of digesting to produce an adequate discussion.

With regard to the Association generally, it continues to prosper. New members and associates are enrolled at each meeting; the programmes are always varied and attractive; and the members possess, in Mr. Percy Griffith, a Secretary who keeps every detail within his grasp, and who ensures, by close application to his duties, a smooth movement of the work at the meetings. The Association has opened up new ground in the engineering profession; and long may success attend it.

A Pitiable Spectacle at Carlisle.

It is fortunately seldom that circumstances arise, in connection with the carrying out of a large scheme of water supply, of the character of those which will be found recorded in another part of the "Journal" with respect to the Geltsdale scheme of the Carlisle Corporation. It may be remembered that this project was introduced by Mr. C. B. Newton, their Gas and Water Engineer, in 1897, with the object of providing the city with an additional supply of water by gravitation, at an estimated cost of about £130,000, which would, as was supposed, leave a good margin for everything. There was some hesitation in entrusting the execution of the scheme solely to Mr. Newton; and, after much deliberation, it was decided to associate with him, as Consulting Engineer, Mr. E. M. Eaton. The name of another eminent Water Engineer was mentioned; and, regarded in the light of subsequent events, it is to be regretted that the views of the majority were against his appointment. However, we fully believe that the decision was come to, as was thought, in the best interests of the city. The necessary parliamentary powers having been obtained, the scheme was launched under the guidance of a Special Committee and the two Engineers; and the outcome of the combined labours of this triumvirate was the passing of a resolution by the Council last Tuesday, on the recommendation of an overwhelming majority of the Committee, to dispense with the services of their two advisers, and to allow the scheme to remain in abeyance for twelve months, after which period the best available advice is to be sought on the scheme.

What, it may well be asked, has led to such a result as this? The answer to the question can be given in a single word—Friction. It appears from the report of last Tuesday's proceedings, and the comments thereon in the local paper, that almost from the very outset there had been friction between the Committee and their Engineer, and they had at last found it impossible to work satisfactorily under the existing arrangements. Moreover, when the lowest tender for the first contract was found to exceed the estimate by £25,000, it was felt there was something wrong; but though the Engineers at once offered to strike off £10,000 by dispensing with "luxurious finish," their reticence upon this matter until it was found necessary to cut down the figures tended to widen the breach already existing. Then the scheme had been materially curtailed by the omission of two filter-beds, and the reduction of the size of a reservoir, without any instructions therefor from the Committee or the Council. In fact, the Committee appear to have been kept in ignorance of important matters in connection with the scheme, as one of the members stated that they had to drag out information "almost by main force at times." It is needless to continue the story. The implicit confidence which the Committee ought to have had in their Engineers seems to have been wanting from the first; and it is attributed in a large measure to the initial mistake of not entrusting the carrying out of the scheme to a thoroughly experienced water-works engineer. It was too much for one who had other duties to discharge; and it is regrettable that the recognition of this fact has had to be enforced by the unpleasant method which the Corporation have felt it necessary to adopt. Of course, the resolution passed does not, as we understand it, affect Mr. Newton's position as Gas and Water Engineer, but only so far as his connection with the new scheme is concerned.

The Index to Vol. LXXVII. of the "Journal," January to June, 1901, is now ready; and a copy will be forwarded (free) by the Publisher, on receipt of a post-card from any subscriber.

North British Association of Gas Managers.—The 40th annual meeting of the Association will be held in the Glasgow University on the 25th and 26th inst.—Mr. W. R. Herring presiding. We learn from the programme issued by the Secretary (Mr. R. S. Carlow, of Arbroath) that, in addition to the general business and the President's Address, there will be two papers—"Some Notes on the Development of Scrubbers, with a Description of a New Type," by Mr. R. W. B. Creeke, of Messrs. Henry Balfour and Co.; and "Gas Enrichment," by Mr. A. Yuill, of Alloa—and a lecture by Professor Ivison Macadam, of Edinburgh, on "Light," which will be illustrated by experiments and lantern slides. The members and lady friends will dine together, in the afternoon of the 25th, in the Grosvenor Restaurant at the Exhibition; and next day there will be an excursion to Loch Lomond.

Association of Gas and Water Engineers of Austria-Hungary.—The twentieth annual general meeting of the Association was held this year in connection with the annual meeting of the German Association in Vienna, as already reported in the "Journal." On the 19th of June, however, the members of the Austrian Association held a short independent sitting for the transaction of private business. The chair was taken by Herr Nachtsheim, the retiring President, who is a civil engineer of Vienna. Among other matters agreed to was a vote of 500 kronen (about £21) to Herr O. Mohrstedt, in consideration of his ten years' services in connection with the official organ of the Association, "Der Gastechniker." Herr G. Wobbe, the Manager of the Municipal Gas-Works in Vienna, was elected President of the Association for the ensuing year; and it was decided that the next meeting should be held in that city.

Sulphate of Ammonia for Wheat Growing.—The current number of "Nature" contains a review of a book on "Wheat Growing," by Professor Italo Giglioli, who, as Director of the Upper Agricultural School at Portici, commenced, in 1887, at Suessola, a series of experiments on the growth of wheat under various manurial conditions. We learn that, as regards the effect of the different manures on the wheat crop, horse-dung with sulphate of ammonia, applied in the spring, gave the highest yield, both of grain and straw. Sulphate of ammonia alone, applied in the spring, gave a higher yield of grain, but less straw than when applied partly in the autumn and partly in the spring. This result is attributed to the excessive rainfall during the winter months. With nitrate of soda there was a much lower yield of grain and rather less straw than with sulphate of ammonia. In accordance with what has been observed at Rothamsted and at Woburn, Professor Giglioli obtained a greater weight per bushel under the influence of sulphate of ammonia than with nitrate of soda. Both of these manures, however, proved to be very effective when applied in conjunction with horse-dung.

Stored Calcium Carbide in a Fire.—In a recent issue of the "Acetylene Gas Journal" of Chicago, an account is given of the behaviour of a quantity of stored carbide of calcium in a fire which occurred on the premises of the G. W. Knox Express Company at Washington (D.C.), which resulted in a loss to the extent of more than $100,000. In the building there were stored 240 drums, each containing 100 lbs. of carbide, besides innumerable other articles; and in view of the general havoc caused, interest is natural as to how this large quantity of carbide fared, as it was stored in a lower extension of the main building, in the roof of which the fire broke out. It was impossible to get at the carbide for some time after the fire was subdued, owing to the dangerous condition in which the walls were standing; but after the *débris* was cleared away, and the carbide reached, the latter was found to be in a remarkable condition. Out of the 240 drums, 18 at the top were broken open, presumably by the falling walls; but the carbide in all but one was in no way injured. The loss of carbide from this drum was complete; the stuff having probably escaped through the fractures of the containing vessel. The remaining 222 drums with their contents were wholly unharmed. It would appear, from the results of this fire, that the storing of carbide of calcium is not attended with the danger generally supposed.

ESSAYS AND REVIEWS.

PROFESSOR GEIKIE ON OUR COAL RESOURCES.

The Need of More Information.

THE case in favour of the appointment of a new Royal Commission on the Coal Question is strengthened considerably by an article in the current number of the "Pall Mall Magazine," from the pen of Professor James Geikie, the well-known geological authority. The need of further inquiry is emphasized not only by Professor Geikie's expressed opinion in favour of the appointment of a Commission, but also, and still more strongly, by the revelation in his article of the very considerable differences existing between the opinions of leading geologists of the present day as to the extent of our coal resources, and between their opinions and those of geologists whose estimates were accepted by the 1866, or Argyll, Commission.

It may perhaps be useful if, before proceeding to consider Professor Geikie's article, we recall the estimates adopted in their report of 1871 by that Commission.* The quantities of fuel in the coalfields of the British Islands at the end of 1869 were stated in that report to be as follows :—

	In Known Coalfields. Millions of Tons.	In Concealed Coalfields. Millions of Tons.	Total. Millions of Tons.
At depths not exceeding 4000 feet	90,207	56,273	146,480
Between 4000 and 6000 feet	5,922	25,841	31,763
Over 6000 feet	1,397	15,303	16,700
Total	97,526	97,417	194,943

The Commissioners reported that the difficulties to be overcome before the quantities of coal believed to lie below a depth of 4000 feet could be brought to market appeared to them so great that they had ignored such quantities in all calculations as to the possible duration of our coal supplies. The available stock at the end of 1869 was, therefore, in their opinion, 146,480 million tons. Deducting the output in the 31 years ended 1900, the Commissioners' estimate would leave us with 141,464 million tons of coal unmined at the beginning of this year, or enough to last us—supposing our coal consumption and exportation continued to increase by an average of 3 million tons annually until the last ton were brought to bank (an absurd hypothesis)—until about the year 2150. It will, however, be noted that no estimated division was made by the Commissioners between the coal contained in thick and that contained in thin seams; nor were any figures given as to the estimated percentages of the 146,480 million tons lying in seams near the surface and those lying near the 4000 feet limit. While, therefore, the report of 1871, if accepted as approximately accurate in regard to the extent of our coal resources, must be regarded as allaying all fears of these resources failing within the life time of the youngest of us, it affords no satisfaction to those who want an answer to the question which is really of practical importance—How long will our cheap coal last?

To this question Professor Geikie hazards no reply, beyond the fairly safe remark that "it is probable that many of our cheaply-worked coals will be exhausted in fifty years"—a statement not calculated to diminish anxiety as to our future commercial prosperity. The need for more information on this point is, indeed, one of the strongest arguments in favour of an official inquiry into the whole subject. In regard to the question of the total quantity of coal in our coalfields, Professor Geikie is, as becomes a Scotsman, very cautious, but not very reassuring, in his statements. Against the Commissioners' estimate of 90,207 million tons (now reduced to 85,191 millions) as being available in the known coalfields, he sets Professor Hull's latest estimate of 58,000 millions, and then practically leaves us to take our choice of these figures—a proceeding of not very great utility. Humbler mortals than the Professor of Geology in the University of Edinburgh might possibly arrive at such a conclusion!

The Commissioners estimated the quantity of coal lying above the 4000 feet limit in the "concealed" fields—that is those overlaid by the Permian and other strata—at 56,273 million tons. Professor Hull's estimate is only 23,253 millions; and Professor Geikie considers the latter figure as being, "perhaps," nearer the truth, though, he adds, "it must be confessed that the grounds for a thoroughly reliable estimate are as yet wanting. We know, from observations made within the last thirty years, that the extension of our 'visible' coalfields in the Midlands, under the overlying Permian and Triassic strata, is not so great as was formerly believed; and Professor Hull's estimate is probably just as reliable as any other that might be made at present. But we may shortly be in possession of more abundant data for forming an opinion; the Government having promised to issue a report on the subject, which is at present being prepared by the Geological Survey." Considering the very wide discrepancy between the figures we have quoted—representing about 150 years' consumption of coal, at the present rate of production—it cannot be denied that more reliable information is needed greatly.

Professor Hull, it will be seen, puts the total available supply of coal above 4000 feet at 82,000 million tons, as compared with the Commissioners' estimate of 146,480 millions. Professor Geikie, while not inclined to accept either figure as approximately correct, favours the addition to all estimates of our coal resources the quantities of coal lying between the 4000 feet and 6000 feet limits, believing "that mining operations in our coalfields need not be limited to a depth of 4000 feet." In support of this inclusion, he quotes actual cases of successful working below that depth, and also the opinions of scientific men who have given the subject their attention.

The greatest depth at which coal has as yet been mined is that of 3900 feet, at one of the collieries at Mons, in Belgium. In Britain, the deepest coal-shaft is approximately 3000 feet below surface at its furthest extremity. But other mines have been carried considerably lower. The Tamarack shaft, and that of the Calumet and Hecla mine, both in the Lake Superior district, reach, we are told, the depths of 4450 and 4900 feet respectively; while it is proposed to carry the latter shaft still lower. The great difficulty to be overcome in these deep workings is, of course, the increasing temperature encountered as the shaft goes downward; the thermometer rising about 1° Fahr. for every 60 feet descended. "In a notable boring put down by the Prussian Government at Paruschowitz, near Rybnik, in Silesia, to a depth of 6570 feet—the greatest depth to which inquisitive man has yet penetrated—the rise in the temperature was 1° Fahr. for every 62·1 feet." This rate of increase would give a temperature of 115° Fahr. at the depth of 4000 feet, hitherto regarded as the limit of possible coal-mining. That, no doubt, says Professor Geikie, "is a high temperature. But experience has shown that an adequate system of ventilation effectually reduces the heat at great depths; and work is carried on vigorously in mines where the temperature of the rock rises considerably above 115°. . . . Referring to the case of the Comstock lode [where men are employed in galleries in which the air and rock temperatures are 116° and 130° Fahr. respectively], Professor Galloway remarks that, 'as work can be carried on in the presence of rock at a temperature of 130°, *without any special means of cooling the air*, it is obvious that, if special means are resorted to, a still higher temperature can be grappled with when the inducement to do so arises.'"

There, however, is the rub, "When the inducement to do so arises." That is to say, coal can only be obtained from these deep lying seams at a cost that so far exceeds the present normal average cost of production as to render it necessary to exclude the quantities that might possibly be obtained from the seams from any estimate of the coal available in this country for practical purposes. Professor Galloway "does not hesitate to express the opinion that a depth of 8000 feet at least may yet be reached in localities where the rate of increase (in temperature) is 1° in 60 feet. It does not appear to him at all improbable that, when there is any real scarcity of coal, and consequently a substantial rise of prices (*say, for example*, 10*s. or* 20*s. per ton*), air-compressing engines of ever-increasing magnitude will be employed for the purpose of cooling the working as the depths of the mines increase sufficiently to require them." The italics are ours. How blissfully ignorant our good friends the professors must be of the practical side of the question to be able to prattle so glibly of a rise in prices of "10s. or 20s. per ton," for all the world as if the trade of the country could go on paying 15s. to 25s. a ton for coal at the pit-head for an indefinite period, or as if capitalists would spend the money on sinking the necessary shafts, and providing the "air-compressing engines of ever-increasing magnitude," unless there were a certainty of such prices being maintained! Why, bless their innocent hearts, before we are reduced to depending upon the coal lying at those depths for our heat and power, we shall be importing coal from America or China, or have found other sources of energy, or have "shut up shop" as a manufacturing nation. What practical men want to know is, How long will the cost of coal mining remain at or about its present normal level in this country? A permanent increase in cost of 2s. a ton would be a sufficiently serious matter for our industries; there is no occasion to speculate as to whether we could obtain coal at an added cost of "10s. to 20s. per ton."

Professor Geikie does not, as we have said, put forward any estimate of our coal resources himself; but, while not trusting implicitly in Professor Hull's revision of the results obtained by the Argyll Commission, he accepts them provisionally, "since it is well to consider our assets from the least favourable point of view." Summarized, these several estimates may be set out as follows:—

	Millions of Tons.
Coal at depths not exceeding 4000 feet—	
In known coalfields	58,000
In "concealed" coalfields	24,000
Total	82,000
Coal between 4000 feet and 6000 feet—	
In known coalfields	6,000
In "concealed" coalfields; probably much more than	8,000
Total	14,000

This gives a grand total of 96 million tons, as compared with the Argyll Commission's estimate of 178,243 millions above the 6000 feet limit—a difference so startling and so material as, of itself, to constitute a sufficient reason for an official investigation; and, as Professor Geikie says, "it is much to be desired, seeing that there

*For fuller discussion of the report of the Argyll Commission, see "JOURNAL," Vol. LXXV., pp. 462, 523, and 528.

is still much uncertainty as to the actual extent of our coal resources, that the whole question should again be put into the hands of a Royal Commission."

Now this question of our coal supply and consumption—embracing the much-disputed subject of our coal exports and their taxation—is of prime importance to the gas industry. Will not some of the leaders of that industry come forward, and, in the Daily Press, add their weight to the movement in favour of a comprehensive inquiry into a matter which it is not exaggerating to describe as of vital consequence to the nation?

ON BEHALF OF THE BIRMINGHAM UNIVERSITY.

In no department of human activity has the propensity of mankind to err been more manifest than in Education. Those who would preserve some respect for the boasted human intellect, as operating through the wisdom of pastors and masters, had better close their eyes to the history of this subject. Not even in matters of Religion, with which it has so much in common, are the corruptions, superstitions, and heresies of Education to be exceeded. There has been some sort of Reformation in Religion; but, in the sphere of Education, the day of Wyclif has only just arisen. We are moved to discuss this matter of Reformed Education here, because the other day Mr. Joseph Chamberlain, Chancellor of the University of Birmingham, presided over the first Congregation of what is intended to be the model modern University of England. We have already commended this institution to the favourable regard of the British gas industry, and entertain the confident hope that in the fulness of time this national industry, with others, will be worthily connected with the latest great English University.

Meantime, it is worth while to pay heed to what Mr. Chamberlain had to say concerning the ideals which are to guide the governing body of the English University of the Twentieth Century. We shall thus ascertain the sense and the degree in which the new institution appeals to the support of practical men with money to bestow, or sons to bring up in the way they should go. According to Mr. Chamberlain's idea, a perfect University should be a place where all existing knowledge is taught. Secondly, the University is to be a place where the knowledge that has been acquired will be tested. Thirdly, the University is to facilitate the increase of knowledge, and the extension of the limits of learning. "Original research, the addition of something to the total sum of human knowledge, must always be an essential part of our proposals. We want to secure that those who teach in this University shall never cease to learn, and that those who are students shall unite with them in the work of fresh and new investigation." Lastly, the University should be a place where the application of knowledge is indicated and directed. To summarize the matter in a sentence, according to Mr. Chamberlain "a University should be a place where knowledge is taught, tested, increased, and applied."

It is only necessary to formulate this ideal, to indicate how widely it differs from all that has come, by a process of corruption, to distinguish the old Univerisity curriculum. It had come to be not merely admitted, but even gloried in, that the ancient Universities of this country were places for the cultivation of useless knowledge. Not long ago, a leading English newspaper declared that these national institutions had better be left to fulfil their office as homes of leisured, unprofitable learning, nurseries of the Church, and schools of good manners. To attempt to make them "useful," it was averred, would only spoil them. And since the Universities set the tone of the Public Schools, which again reflect upon the whole primary educational system of the country, it is not to be wondered at that the separation of this educational system from all the work-a-day life and industry of the country was radical and irreconcilable.

English-like, of course, we have hitherto attempted to compromise the difference. The purely literary character of our elementary schooling has been supplemented by the teaching of "subjects," which were supposed to supply the wants of school children in respect of "useful information." It is difficult to say which kind of instruction inspires with greater disgust the average intelligent citizen who is called upon to pay for it. Then, the higher elementary and preparatory schools have ostentatiously added "Modern sides" to their establishment, with the result that those boys who did not take "classics" were crammed with stuff of no more real use to them, while all the great prizes of the schools remained the reward of their fellows of the older side. The classics are still the only roads to admission into the ancient Universities, whose costly degrees are for the most part valuable in but three or four of the callings by which men earn their bread. Truly, there was nothing to be done with such a system except to "by-pass" it altogether, as the founders of the Birmingham University have done.

What we are particularly anxious to point out is the not generally recognized truth that, in adopting the principles already expounded, the founders of the new English University have exactly followed the precedent of the ancient educationalists, whose schools and Universities were originally started with a severely practical object. If these old Founders and Benefactors had the work to do to-day, it is certain, from the memorials they left, that their place would be alongside Mr. Chamberlain and his colleagues, and not with the dons of an outworn culture. There remains as testimony of the educational aims of the ancient days an order of the Scottish justiciaries directing all barons and lords of land over a certain annual value, to send their eldest sons to the accredited seats of learning where they might be properly instructed in the Latin tongue, in order that they might read the laws of the kingdom and be efficient dispensers of justice in their domains. What could be more practical? Again, when Erasmus and his associates restored the study of Greek, it was with the particular and most practical object of throwing open to mankind the only storehouse of Science.

Well, now, see what this has come to. Long after the means have served their turn, the vested interest of Pedagogy, like the spirit of Trade Unionism, clings to the forms in which useful knowledge was once locked up, and refuses to recognize any other kind of learning. It is Trade Unionism, nothing more nor less. The discovery has been made—not by the pedagogues—that the study of Greek and Latin constitutes a useful sort of mental gymnastic; so that some minds which have been exercised in it, and in nothing else, have great ease in grasping other matters. Hence, the defence of a strictly classical school and University curriculum is now often made upon this ground. It is a reasonable ground, so far as it goes. But it is of the nature of an afterthought, and an excuse. So long as all the best material prizes of scholarship are allotted to proficiency in classical studies, these scholastic pursuits will continue to have an unfair advantage over others. The great wrong of this corruption of what was originally good, and indeed the only possible kind of learning, is that the minds which are not susceptible of it are not only left outside the operations of the goodwill of those who encouraged it when it occupied a different place in the world of intellect, but are placed at a positive disadvantage by the tradition that has been attached to this culture.

Ask of Charles Darwin what Cambridge did for him. Ask, in another sphere of intellectual activity, what his University course did for James Payn. Read the life of Lord Justice Bowen, and mark what the orthodox grammar school "education" was in his case. There is in the biography of the last-named, a letter from one of his schoolmasters which it is difficult to read with patience. It enumerated the obscure Latin authors whom the boy had read, which is as much as to say that he had spent his time in practising throwing peas from a certain distance into various receptacles very ill contrived for the purpose! Of course, those who think thus lay themselves open to the cheap sneer that "fools no Latin know," and are reminded that classical scholarship, though useless, puts a glitter upon those who possess it which nothing else can supplant. This is true, to an extent, of some whose minds are naturally adapted to receive this peculiar polish. But it is only done at disproportionate cost; and the number of "wasters" would long ago have condemned the system, had there been no vested interests enlisted on the side of its maintenance. It is a long way from Heine to the poor Rossall lad who recently committed suicide because he could not manage his Virgil; but the tale of dumb victims of classical schooling is longer still.

The stupidest thing of all, perhaps, about classical studies after the manner of the Pedagogues—who, of course, take their cue from the Universities—is the habitual neglect of the only aspect of this learning which possesses the smallest living interest or value for English students. No man who in the course of his career is concerned for the correct and elegant use of the English language—and who is not?—entertains aught but the deepest veneration for Latin, and a great respect for Greek; but it is never the Latin or the Greek of his school days. When he remembers how he was made to smart because his thick, matter-of-fact Saxon brain—the brain of a child at that—failed to grasp the true inwardness of the poetic ravings of Virgil's gods and goddesses, he is apt to wish he had the handling of his old tutor for a few minutes. Why are not Greek and Latin taught in the light of the science of language? Because of Balliol Scholarships, and the like. Trade Unionism again!

The familiar antithesis between the classical and science culture is false, and has no other basis than Trade Unionism. The Birmingham University, we may hope, will help to break the barrier down. An Oxford don, a famous Dean of Westminster, may be ignorant of the multiplication table, but that sort of lop-sided culture cannot be tolerated in this Twentieth Century for less eminent persons. Birmingham will not neglect the classics, we may be sure; but in this and in all other learning it will not transgress the Scientific Method. It is the supremacy of this method in all learning which the foundation of the new University means, if it means anything at all; and it is for this reason that we, from our humble and specialized standpoint, wish all success to the noble enterprise which has Mr. Chamberlain for its sponsor, and the intellectual advancement of the whole of the English people for its object.

Coal Production in the United States.—It is officially stated that the production of coal in the United States last year amounted to 238,877,200 tons, valued at £59,578,400; the aggregate exceeding that of Great Britain by no less than 13,707,000 tons. Owing to the strike in the Pennsylvania anthracite region in the latter part of the year, the output of anthracite coal was about 3,000,000 tons smaller than in the preceding twelve months; but the diminution was much more than counterbalanced by the increased production of bituminous coal.

ELECTRIC LIGHTING MEMORANDA.

Electric Wire Fire at the Birkenhead Town Hall—Formal Inauguration of the New Lines of the London United Tramways Company—Speech by Mr. A. J. Balfour.

RECENT experiences at Birkenhead go to show that the danger of fire has not ceased to be a considerable quantity in connection with installations of electric light. By an odd coincidence, the British Association of Water-Works Engineers had been occupying the Town Hall for a couple of days, for their annual meeting, and were dining in the building when the Fates arranged for their delectation an admirable display of fire, with the usual accompaniment of "brigade" exercises. The cause of the fire unquestionably was the wire connection with an electrolier which lighted one of the rooms, used as an ante-room to the Council Chamber. The statement relating to this incident, given in our special report of the proceedings of the Association, is by an eye-witness of the outbreak. As is not infrequently the case, the building was wired without much reference to the possibility of getting at the connections in the event of anything going wrong. This particular electrolier was far overhead, and quite inaccessible during the critical ten minutes when the fire might have been beaten out with a napkin. Once started, however, the fire rapidly gained a hold of the timber framing of the pinnacle and upper portion of the tower. The lower portion of the building is of stone; but the upper interior works are chiefly of wood. The showy cupola and finial appears to have been framed of timber, not too massive, covered with zinc. This grandly fed the flames; and accordingly, the tower burnt itself out. The catastrophe was a good object-lesson for the Water Engineers; while electricians should learn something from it.

A striking commentary upon our recent articles dealing with the question of the Housing of the Poor was supplied last Wednesday by the opening for traffic of our 15 miles of electric tramways in West London. We showed that the Housing Question is very largely a transport question; and here was the confirmation of the contention. More—whereas we pleaded for a fuller measure of co-operation between the national and local governments and existing transport agencies, this tramway function was honoured by the presence of the First Lord of the Treasury, another Cabinet Minister, and a host of other notables. Let us hope that this auspicious event will signalize the commencement of a new era in the relations between British governing authorities and tramway and railway companies. The London United Tramways Company, who were the hosts on this occasion, are the first undertaking of the kind in the neighbourhood of London to show what a tramways company can do when relieved from the dead hand of the well-meant, but mistaken, legislation in the presumed interest of local authorities. There is only one way of getting over the provision of the Tramways Act which requires lines to be handed over at the stated time to local authorities at an old-iron price; and that is to cover the territory of so many local authorities that no one of them shall have a chance of taking advantage of the Act.

This is what the London United Tramways Company have done. They began in a comparatively small district of West London, and pushed their extensions in all directions. None of the local authorities of this somewhat neglected region was strong enough to forestall them. Some of the methods employed by the Company to gain their ends were not what is usually understood to be tramways business. For years, the Engineer and Managing Director of the Company had to engineer district council elections rather than mere technical matters; but in the end the Company usually won their way. They had determined to electrolize the service; and they wanted mileage. In order to obtain this scope, it was necessary to undertake an enormous amount of roadway improvement. Off the main roads branching from Shepherd's Bush Green (the terminus of the "twopenny tube") to Brentford and Acton, which are wide thoroughfares, the ancient roads in this part of the world are only lanes. It would have been quite impossible for the small local authorities to incur the expense of widening and straightening these tracks; nor would they have been justified in undertaking the work. Neither would a tramway company with a limited life have been able to open up such a district. What these bodies, with their limited and temporary powers could not do, a big permanent company can both easily and legitimately arrange for, with an eye to the future. Therefore, it was no mere figure of speech that Mr. Balfour used when on Wednesday he spoke of the West London tramway undertaking as "one of the greatest engines of social reform and amelioration that any corporation had been privileged to start." Nobody can foresee the development of this vast region, under the inducement of cheaper and more rapid means of transport than any other London suburban district enjoys. As Mr. Balfour remarked, no legislative manipulation with landlords, or questions of compensation, really touch the heart of the Housing Question as it is touched by such a great scheme as this which makes so gigantic a difference in the cost of communication between the inside and the outside areas of London. It is safe to say that those who have known the outer western suburbs of London in the past, and up to the present time, will notice a tremendous difference in the course of a very few years; while other areas will be proportionally relieved of the pressure of population they at present experience.

THE GAS AND WATER STOCK MARKET.

THE Stock Exchange has had a terribly flat week; and the shrinkage in prices has been on a scale only to be paralleled in a panic week. Yet there is nothing whatever apparent to cause any alarm; and the depression seems to be quite attributable to influences which will give way in good time. But, for the present, the result is that nobody seems inclined to buy, waiting for things to go a bit lower still; and a little compulsory realization does a good deal to knock prices down. The closing mark on Saturday in Consols was 91¾—the lowest on record since the conversion. The Money Market was very quiet, though becoming a little brisker towards the close, with a slight tendency in the direction of hardening. Business in the Gas Market was very fairly active, if the general run of things be considered; and, if allowance be made for the extreme flatness that ruled all round, then the tendency may be regarded as being favourable. For hardly any changes in quotation took place, and stock could be offered and accepted in the market without the price being knocked down as was to so great an extent the case in other departments. In Gaslight and Coke issues, there were moderate dealings every day in the ordinary, and prices were quite steady; but just at the close the quotation was lowered a point, although the last prices were as good as the opening figures. The secured issues were more than usually active, especially the preferred, and without change. Business in South Metropolitan was quite limited, and gave no sign of any alteration. A few bargains were marked in Commercials; but the figures were not remarkable either way. Very small business was done in the Suburban and Provincial group; and all quotations in London were left standing. In Sheffield, the local "B" and "C" issues were promoted to the level of the "A." Among the Continental Companies, a fair amount was done in Imperial at level prices; but here too (as in the case of Gaslight ordinary) the quotation was dropped at the close. There was nothing in connection with the undertakings in the remoter world calling for comment. Business in the Water Companies was more active; and there seemed to be a greater disposition to realize. Wherever this was done prices dropped; and Kent, Lambeth, and New River had a smart fall.

The daily operations were too much alike to be distinguished separately, for the same prices were marked every day with surprising consistency; and it was only on Saturday that any change in quotation occurred, when Gaslight ordinary receded 1, and Imperial Continental 1½. Water, however, was more agitated; and on Tuesday Lambeth fell 5, and New River 3. On Thursday, Grand Junction moved down 1. And on Friday, Kent fell 5, and New River 2.

PERSONAL.

Mr. W. HELLOCK, of Alloa, has been appointed Manager of the Kilsyth Corporation Gas-Works, in room of Mr. W. Hamilton, resigned.

At the first meeting of the Council of the Society of Arts after the annual election, Sir WILLIAM HENRY PREECE, K.C.B., F.R.S., was chosen as Chairman for the ensuing year.

The honorary freedom of Southport has been presented to Alderman RICHARD NICHOLSON, J.P. It was during his mayoralty, in 1876, that the first attempt was made to purchase the property of the Water Company—a project which was then unsuccessful, but which is now, by the Bill of the present session, on the way to accomplishment.

As will be seen by an announcement which appears elsewhere, the British Gaslight Company are seeking a successor to Mr. JOHN YOUNG at Norwich. The reason is the removal of Mr. Young to Hull, the management of this station, which has for 27 years been in the hands of Mr. ANDREW DOUGALL, having been relinquished by that gentleman, who has been granted a retiring allowance, which we trust he may live long to enjoy. We heartily congratulate Mr. Young on his promotion, and wish him success in his enlarged sphere of labour.

A special meeting of the Gas Committee of the Birmingham City Council was held last Wednesday, for the purpose of making a presentation to Mr. EDWIN SMITH (who, as our readers are aware, has lately retired from the service of the Corporation), as a token of their high appreciation of the manner in which he fulfilled his duties for nearly a quarter-of-a-century as the Secretary of the Gas Department. Mr. J. H. Lloyd (the Chairman of the Committee) presided. The presentation consisted of a large silver rose bowl, of Early English design, upon an ebony stand, bearing on a panel the inscription: "To Edwin Smith, on his Retirement from the Secretaryship of the Gas Department, Birmingham, from the Members of the Committee, March, 1901." The letters "E. S." are monogrammed upon a corresponding panel on the other side of the vessel. At the bottom are the names of the members of the Committee. Accompanying the bowl was an address, bound in Niger leather and artistically illuminated and engrossed on vellum in Early English characters, embodying a resolution of the Committee, placing on record their high appreciation of the manner in which Mr. Smith discharged the duties of his office (in which he displayed business acumen of the highest order, had integrity, and a self-sacrificin attention that contributed in no small measure to the prosperity

of the gas undertaking), and expressing the hope that he might enjoy for many years his well-earned retirement. The address having been read by Mr. Barber, the Chairman asked Mr. Smith's acceptance of the gifts; referring in terms of high praise to the great administrative ability displayed by him, and to the untiring zeal with which he had discharged his great and responsible duties for so many years. Mr. Bishop also spoke in warm appreciation of Mr. Smith's services, cordially endorsing all that the Chairman had said. Mr. Smith, who was deeply affected, acknowledged the presentation; expressing his grateful sense of the honour and distinction which the Committee had conferred upon him. It was difficult, he said, for him to find words to adequately express his appreciation of the kindness and generosity which prompted the gift, and of the great thought which had been exercised to make the presentation in a form which afforded him the greatest possible pleasure.

NOTES.

Ammoniacal Liquor as an Insecticide.

Some time ago, M. Willot laid before the Belgian Association of Gas Managers the results he had obtained by the use of ammoniacal liquor for destroying the nematoids which attack sugar beet and other crops. The efficacy of the treatment recommended by him has been recognized by the French Government and the Press; a report on the matter having been presented by M. Graux, the conclusions of which have been embodied in Article 66 of the Standing Orders of the Chamber of Deputies. They were to the following effect: The Minister of Public Works was recommended to negotiate with the transport companies for a reduction of the tariffs applicable to ammoniacal liquor, and for the construction of tank-waggons to convey it; the Minister of Agriculture was recommended to encourage, by means of subsidies, the use of ammoniacal liquor as an insecticide (especially of the *Heterodera Schachtii*), either by direct payments to the agriculturists employing it, or by entering into contracts with the owners of gas-works for supplies of the liquor, and placing it at the disposal of cultivators; finally, the Minister of Agriculture was recommended to reward M. Willot for his labours, either by conferring upon him an appointment which would enable him to make his system more widely known, or by granting him some pecuniary assistance to enable him to continue his experiments. M. Graux added that M. Willot, who was as disinterested as he was modest, did not ask for any payment; and therefore there was all the more reason the services he had rendered should be rewarded as they deserved. The system adopted by M. Willot is to apply the liquor in the form of spray.

A Practical Test for Linseed Oil.

The paint and oil correspondent of the "Ironmonger" recently gave a description of a useful store-keeper's test for the quality of this commodity. He remarks that most of the text-book methods for testing linseed oil can only be carried out by a skilled chemist; but the following is quite simple, and has the advantage of showing the real drying power of the sample. It requires a standard specimen of acceptable oil, which may either be one that has been analyzed and pronounced genuine and of good quality, or one from which some thoroughly satisfactory paint has been previously made up. The test consists in coating two similar pieces of clean glass with some of both samples of oil, by dropping a little upon the centre and carefully spreading it over the surface of the glass as nearly equally as possible. The two plates are then to be laid aside in a place protected from dust, but freely exposed to air and light. If facilities are at hand, the drying may be hastened by keeping the samples at the same uniform temperature of not more than 100° Fahr. Uniformity of treatment is, of course, essential. It is important to observe whether the sample to be tested dries more or less quickly than the standard; but the most important matter is to compare the physical characters of the two dried films. They should be touched with the finger for difference in tackiness, and then rubbed gently to see which tears the more easily. They may also be tried with the edge of the nail, to ascertain whether they differ in hardness, and for even drying all through. An oil which dries superficially to a hard, thin, and rather brittle skin is always to be looked upon with suspicion. What is wanted is a tough, leathery skin, equally dry right through to the glass.

Effects of Illuminating Gas Upon Asphalte Pavements.

Mr. Nelson P. Lewis, the Engineer in charge of the highways in the borough of Brooklyn, discusses in his last year's report the injury of asphalte pavements by escapes of illuminating gas. It appears that some years ago there was severe competition between the gas companies of the borough, and many miles of unnecessary pipes were laid in an inferior manner. Later, when the gas manufacturing stations fell into the inevitable agreement, some of these defective distributing mains were converted into trunk pipes worked at high pressures, with the result that they leaked heavily. In some instances this leakage amounted to 13 per cent. of the output, which does not say much for American mainlaying practice. The serious effects of the escaped gas on the asphalte pavement of the streets were first noticed in the thoroughfares where mains were hastily laid in competition for new consumers. The injury announced itself in a fine "checking" of the surface, which was followed by the total disintegration of the pavement. A great many tests were made by driving down bars through the pavement showing these indications, when gas was usually found—sometimes in sufficient quantity to burn fiercely. The connection between this peculiar appearance of asphalte pavements and leaky gas-mains has been clearly established. In several cases disputes have arisen between the gas companies and the purveyors of asphalte paving as to who is responsible for this kind of damage; but that it should have occurred at all, reflects as much discredit upon the street paving practice of Brooklyn as upon the mainlaying. The asphalte could not have been laid upon a sound bed of concrete, such as really constitutes the road where good work of the kind is understood.

Messrs. Crossley's Show at Cardiff—A New Gas-Producer.

The show of gas and oil engines at the Royal Agricultural Society's show at Cardiff, is discussed by "Engineering," which remarks that the gas-engine is becoming a dwindling feature of the show. At Cardiff there was no gas supply laid on to the show ground, wherefore two gas-engine makers had power-gas plants of their own to work their exhibits. Messrs. Crossley Bros. had a producer plant of a new type, stated to be made under patents of Mr. Crossley and Mr. Atkinson. It is understood that this plant is the outcome of a prolonged experience of the use of power gas at Messrs. Crossley's Manchester works, where they have 700 indicated horse power generated in this way, at a considerable saving on the cost of steam. It does not differ essentially from any other make of power gas, unless in respect of its renewing the old attempt to dispense with a separate boiler. In lieu of a steam-boiler, the hot gas, at its exit from the producer, is led through a series of trays filled with coke, over which water trickles. The native heat of the gas is in this way transferred to the water, to its own advantage in respect of its being washed and cooled. The hot water, in turn, flows over trays of coke through which the air supply to the producer is driven by a fan. As the air gets heated, so it progressively meets with hotter water, and thereby becomes loaded with all the moisture it can carry. Lastly, the air is led through a jacket-space surrounding the producer, where it obtains a superheat before finally entering the fuel-bed. The faster the producer is worked, the hotter is the gas, and the more hydrogen it carries. Apart from this ingenious gas-producer, the oil-engine dominated the Cardiff show; Messrs. Crossley gaining the Society's special prize for a 15-horse power engine consuming 0·71 lb. of "Royal Daylight" oil per indicated horse power per hour. An engine of Messrs. Ruston, Proctor, and Co. was a good second.

One of the longest mains for natural gas ever laid is a pipe of the Philadelphia Company extending from the gas-fields of Wetzel County (W. Va.) to Pittsburg. It is 90 miles in length and 10 inches in diameter. The initial pressure at the wells is about 350 lbs., and the discharge pressure is from 10 lbs. to 50 lbs. With this drop the pipe delivers about 10 million cubic feet of gas per 24 hours.

The marriage of Mr. T. H. Duxbury, Engineer and Manager of the South Shields Gas Company, eldest son of Mr. T. Duxbury, of Manchester, with Miss Maria Patefield, daughter of Mr. T. Patefield, of Bradford, was solemnized last Wednesday afternoon, at the Baptist Chapel, Heaton, Bradford. The bride was given away by her cousin, Mr. T. Bower, of West Hartlepool. A reception was subsequently held at the Midland Hotel, about a hundred guests attending it. There were a large number of beautiful presents; among them being a silver salver, with suitable inscription, from the South Shields Gas Company.

In view of the fact that the engineering works of the New Conveyor Company at Smethwick were the first erected for the exclusive manufacture of mechanical conveyors and elevators, it is interesting to learn that Mr. Gilbert Little, the founder of these works, in his researches with regard to the maker of the first mechanical conveyor, has established the claim to that honour to Matthew Boulton, of Messrs. Boulton and Watt, who, in 1788, at the Soho Works, Smethwick, put up an iron-plate belt-conveyor to transport the pieces of laminated metal from one part of the works to the coining-stamps in another; while William Murdoch, the inventor of gas lighting, was employed as a millwright in the construction of this novel automatic appliance.

Owing to advanced age and failing sight, Dr. A. W. Williamson has been compelled to resign his appointment as Chief Gas Examiner for the Metropolis—an office which he had held since 1876, when he succeeded the late Dr. Henry Letheby, who was the first to fill it after its creation. We learn that the Board of Trade have selected Lord Rayleigh for the position. The new Chief Gas Examiner is universally known for his scientific work, which need not be alluded to here at any length. He was born in 1842, and in 1865 he graduated in the Cambridge Mathematical Tripos as Senior Wrangler, and was awarded the first Smith's Prize—obtaining in the following year a fellowship at Trinity College. In 1879, he succeeded Clerk Maxwell at Cambridge, and while there the various electrical standards were accurately determined. In 1885, he commenced experiments upon the density of gases, which led subsequently, in conjunction with Professor Ramsay, to the discovery of argon. Lord Rayleigh presided over Section A of the British Association in 1882; and in 1884, when the Association met in Montreal, he was President.

TECHNICAL RECORD.

THE LARGE GASHOLDER FOR NEWCASTLE.

(*Concluded from p.* 88.)

To complete the description of the holder, the crown-framing and the guide-framing only remain to be dealt with. One of the drawings referring to the latter is given as a supplement to this issue of the "JOURNAL."

Details of the crown-framing may first be given. It will be composed of rolled steel joists and T-steel stays, with wrought-iron diagonal bracing. The standards will be set out in four rings. The outer and second rings will each consist of 52 rolled steel joists, 12 in. by 5 in. by 32 lbs. per foot, each in one length without joint, fitted with base plates and ears, and braced together with two sets of wrought-iron tie-rods $\frac{7}{8}$ inch diameter. The third ring will consist of 26 rolled steel joints of similar measurement and fittings, but having only one set of bracing. The centre ring will comprise 26 rolled steel joints, 10 in. by 5 in. by 29 lbs. per foot, and fitted with shoes and ears, and braced together with two sets of $\frac{7}{8}$-inch wrought-iron tie-rods. The different rings of standards will also be tied together radially with diagonal bracing 1 inch diameter. Each upright standard is to be secured by four Lewis bolts 1 inch diameter let 7 inches into the concrete.

From the centre ring to the outer line there will run 26 main radial joists, 6 in. by 5 in. by $\frac{7}{16}$ in. by 25 lbs. per foot run, breaking joint in all cases over the upright standards. From the third row of columns to the outer line will run 26 intermediate radial joints, of the same dimensions. These joists will also break joint over the upright standards; and the inner ends will be cut and fitted into the purlin joists of the third line. They will be bent and set to the true curve of the gasholder crown. Four rows of main purlins will run right round the framing at the same centre line as the uprights. These purlins will all be formed of rolled steel joists, 6 in. by 5 in. by $\frac{7}{16}$ in. by 25 lbs. per foot. The two outer rings and the centre ring will be cut square and straight; but the third ring will be set to the true radius. All the purlins will be cut and fitted into the radial joists, and connected to them by means of $\frac{3}{8}$-inch plates. These plates will also form the cover-plates for the joints in the radial joists. The upright standards will be further attached to the radial joists by means of T-bar struts, 5 in. by 4 in. by $\frac{3}{8}$ in., and to purlins by T-bar struts, 5 in. by 3 in. by $\frac{3}{8}$ in. The radial joists will all be bound together in the centre by a welded ring of steel channel, 10 in. by $3\frac{1}{2}$ in. by $\frac{1}{2}$ in., and 5 ft. 6 in. diameter outside. The top flange of the 6 in. by 5 in. radial joists will be cut away, and a circular $\frac{1}{2}$-inch plate 7 feet diameter will be riveted to the channel, and attached to the joists by means of angle knees, $3\frac{1}{2}$ in. by 3 in. by $\frac{1}{2}$ in., so that the plates and top flange of the joists are all level. The 6 in. by 5 in. joists will be carried underneath by a welded ring of angle steel $4\frac{1}{2}$ in. by $4\frac{1}{2}$ in. by $\frac{1}{2}$ in., riveted to the channel ring. There will also be two other rings on the centre post, composed of channel steel 6 in. by 3 in. by $\frac{1}{2}$ in. by 19 lbs. per foot, welded solid. The upper ring will be 5 ft. 10 in. diameter inside, and the lower ring 6 ft. 8 in. diameter inside. Each of these rings will have 13 lugs of T-steel, 5 in. by 4 in. by $\frac{3}{8}$ in. by 6 in. long, riveted on with four rivets, to take the double eyes of the bracing ties. After the lower ring is fixed in position, a welded ring of angle-iron, 4 in. by 3 in. by $\frac{1}{2}$ in., will be lowered down on to it, and fixed to the wall by 13 Lewis bolts, 1 inch diameter, let 5 inches into the wall and run with lead.

Coming to the guide-framing, this is partly erected, and so we will treat of it as a finished portion of the structure. The standards number 26, composed of plates, angles, channels, tees, &c., and resting on cast-iron bases, 8 ft. 8 in. by 4 ft. by $10\frac{1}{2}$ in. high. The metal in the bases is $1\frac{1}{2}$ inches thick; and there are two longitudinal and three cross ribs to each base $1\frac{1}{2}$ inches thick, and the full depth of the base. To each standard base are six bosses, with 3-inch diameter holes cast in from the $2\frac{1}{2}$-inch holding-down bolts. The bases are in one piece, and were faced entirely over both the top and bottom bearing surfaces in a planing machine. Through the top of each base were drilled 24 holes for $1\frac{1}{2}$-inch bolts.

The standards are 8 feet deep at the bottom and 2 ft. 6 in. deep at the top, and measure 134 ft. $7\frac{1}{2}$ in. over all. The base-plates are 8 ft. by 4 ft. by $\frac{3}{4}$ in.; the main angles, 6 in. by 6 in. by $\frac{5}{8}$ in. for a distance of about 82 feet from the base, and 5 in. by 5 in. by $\frac{1}{2}$ in. from there to the top. The covers to the first-named angles are $5\frac{1}{4}$ in. by $5\frac{1}{4}$ in. by $\frac{3}{4}$ in., and to the second-named angles $4\frac{1}{2}$ in. by $4\frac{1}{2}$ in. by $\frac{5}{8}$ in. The angles break joint in all cases.

The bottom web is 5 feet deep and $\frac{1}{2}$ inch thick, and the full width of the standard, and is attached to the base-plate by means of two 6 in. by 6 in. by $\frac{5}{8}$ in. angles joggled over the vertical angles. There are two gussets on each side of the bottom web, of $\frac{1}{2}$-in plate and $4\frac{1}{2}$ in. by 4 in. by $\frac{1}{2}$ in. angles, riveted to the web and base-plate. The webs on the back and front of the standard are 18 in. by $\frac{1}{2}$ in. from the base to the third girder and 12 in. by $\frac{1}{2}$ in. from there to the top. There is a cross web at the centre of each line of girders $\frac{1}{2}$ inch thick. The first and second webs from the bottom are 3 feet deep, the third and fourth 2 feet deep, and the fifth 1 ft. 6 in. deep. These cross webs are attached to the main webs by means of large covers of different sizes and $\frac{1}{4}$ inch thick. There is no cross web at the sixth girder, but instead two $\frac{3}{8}$-in. cover-plates, riveted to the 12 in. by $\frac{1}{2}$ in. vertical webs at each side.

The flanges are 4 feet wide at the base, and taper in a sweep to 2 ft. 6 in. wide, at 8 feet from the base. From this point there is a straight taper to the top, which is 1 ft. 6 in. wide. There are three plates on the back of the standard, two $\frac{3}{8}$-inch thick, and one $\frac{1}{2}$ inch. The first $\frac{3}{8}$-inch plate stops about 78 feet from the bottom, and the second one about 102 feet. The $\frac{1}{2}$-inch plate runs right through. There are two plates on the front of the standard, $\frac{1}{2}$ inch thick, both running the full height, and tapering in the same manner as the back plates. The front and back plates all break joint with one another, except at the bottom, and all joints on the same side are at least $10\frac{1}{2}$ inches apart. It was stipulated in the specification that, when more than one plate was joined under one cover, cover strips the full length and same thickness as the cover must be inserted on the inside next to the angle. The diagonal bracing of the standard is composed of steel channel bars. Between the base and the first girder the bracing is 6 in. by 3 in. by $\frac{1}{2}$ in. by 19 lbs. per foot; between the first and second girders, 5 in. by 3 in. by $\frac{1}{2}$ in. by 16 lbs. per foot; between the second and third girders 5 in. by $2\frac{1}{2}$ in. by $\frac{3}{8}$ in. by 12 lbs. per foot; between the third and fourth and fourth and fifth girders, 4 in. by $2\frac{1}{2}$ in. by $\frac{3}{8}$ in. by 10 lbs. per foot; and between the fifth and sixth girders, 3 in. by $1\frac{1}{2}$ in. by $\frac{3}{8}$ in. by $7\frac{1}{2}$ lbs. per foot. At their intersection, all the channels have round wrought-iron packings inserted.

The front and back members of the standards are further tied together by horizontal T bars, with corner gusset plates. The bars are 6 in. by 4 in. by $\frac{5}{8}$ in. in the first bay, with $\frac{1}{2}$-inch gussets; 6 in. by 4 in. by $\frac{1}{2}$ in. in the second bay, with $\frac{1}{2}$-inch gussets; 6 in. by 3 in. by $\frac{1}{2}$ in. in the third and fourth bays, with $\frac{1}{2}$-inch gussets; and 5 in. by 3 in. by $\frac{1}{2}$ in. in the fifth and sixth bays, with $\frac{3}{8}$-inch gussets. The whole of the rivets in the main angles, flanges, ends of girders, struts, and all connections at the base are $\frac{7}{8}$ inch diameter; and the remainder $\frac{3}{4}$ inch.

The guide-rails up the front of the standards are formed of rolled joists, 8 in. by 6 in. by $\frac{1}{2}$ in. by 35 lbs. per foot, secured to the standard by means of cast-steel brackets, of size suitable for the angles and the width of the flange-plates. The bottom of the guide-rail is secured by a small steel casting, fastened to the base-plate with studs, and shaped to fit the joist. The brackets are riveted to the standard with four 1-inch diameter rivets, and the guide-rail is bolted to them with 1-inch bolts, countersunk on the face.

Regarding the girders, there are six rows—the five lower ones placed horizontally, and the sixth upright. The horizontal girders are exactly similar in design, with solid welded T-steel frames, 6 in. by 4 in. by $\frac{3}{8}$ in., and 12 in. by $\frac{3}{8}$ in. flange-plates. The end webs are cut to line with the angle of the lattices, and gussets are inserted at the back and front to connect them to the flanges of the standards. These gussets are 6 in. by 4 in. by $\frac{3}{8}$ in. T steel, with $\frac{3}{8}$-inch plate webs for the lower girders; but, in the case of the upper girders, where the gussets are very narrow, the web of the T will be welded up solid.

The widths of the girders over all are: First row, 4 ft.; second 3 ft. $7\frac{1}{2}$ in.; third, 3 ft. 3 in.; fourth, 2 ft. $10\frac{1}{2}$ in.; and fifth, 2 ft. 6 in. The sixth, or top row, of girders, is 3 feet deep over all, and (as already stated) is placed upright. They are formed of 6 in. by 4 in. by $\frac{1}{2}$ in. T steel welded frames, 9 in. by $\frac{5}{8}$ in. flanges, and $2\frac{3}{4}$ in. by $2\frac{3}{4}$ in. by $\frac{1}{2}$ in. angle lattices. The end webs are $\frac{3}{8}$ inch thick, cut out to line with the lattices. There are also $\frac{3}{8}$-inch taper plates on the top and bottom at the ends, riveted to the flanges and to 4 in. by 4 in. by $\frac{1}{2}$ in. angles on the standard. The rivets through the girder ends are all $\frac{7}{8}$ inch diameter; the remainder, $\frac{3}{4}$ inch.

The standards are braced together by diagonal bars between the rows of girders. These bracing bars are composed of steel flats, riveted to shaped plates on the standard backs, and secured at the crossing by a single plate riveted to both bars. The bottom tiers consist of 8 in. by $\frac{3}{4}$ in. bars, with $\frac{3}{4}$-inch plates; the second tier of $7\frac{1}{2}$ in. by $\frac{3}{4}$ in. bars, with $\frac{3}{4}$-inch plates; the third tier of 7 in. by $\frac{5}{8}$ in. bars, with $\frac{5}{8}$-inch plates; the fourth tier of $6\frac{1}{2}$ in. by $\frac{5}{8}$ in. bars, with $\frac{5}{8}$-inch plates; the fifth tier of 6 in. by $\frac{5}{8}$ in. bars, with $\frac{5}{8}$-inch plates; the sixth tier of 5 in. by $\frac{5}{8}$ in. bars, with $\frac{5}{8}$-in. plates. The whole of the rivets used in these diagonal ties are $\frac{7}{8}$ inch diameter. To the shape, set, and finish of these standard plates the contractors' attention was specially directed in the specification.

From the level of the coping to the top of the sixth girder, there will be an iron ladder, 11 inches wide inside—the bottom ends let 6 inches into the stone, and the top bent over, welded, and attached to a bracket on the top of the sixth girder. There is to be a small chequer-plate ($\frac{5}{16}$-inch) platform on each of the five lower girders, with handrails. There is also to be a landing platform on the crown of the holder opposite the ladder; and round the crown three lines of handrails are to be provided.

We have come to the end of the details which it is necessary to give in order that the reader may have the characteristics and full measurements of each section of the work under his survey and at his future command. Much of minor and local importance has been omitted, as no useful service would be accomplished by its publication. Perhaps it is only right to repeat, lest readers may have overlooked it and jump at the conclusion that Mr. Gibb has erred on the side of substantiality, that the site of the holder is an exposed one, old colliery workings exist below, and beyond

boring he had had no experience of the ground. These conditions it was, of course, necessary to take into consideration. The total cost of the completed work is computed at about £77,000.

We have, in conclusion, to thank Mr. Gibb for the material he placed at our disposal for the preparation of these articles, and for his kindness in checking the measurements before publication.

DIFFERENTIAL RATES FOR GAS.

By Herr W. von Oechelhaeuser, Managing Director of the German Continental Gas Company.

[A Paper read before the Meeting of the German Association of Gas and Water Engineers at Vienna, June 17.]

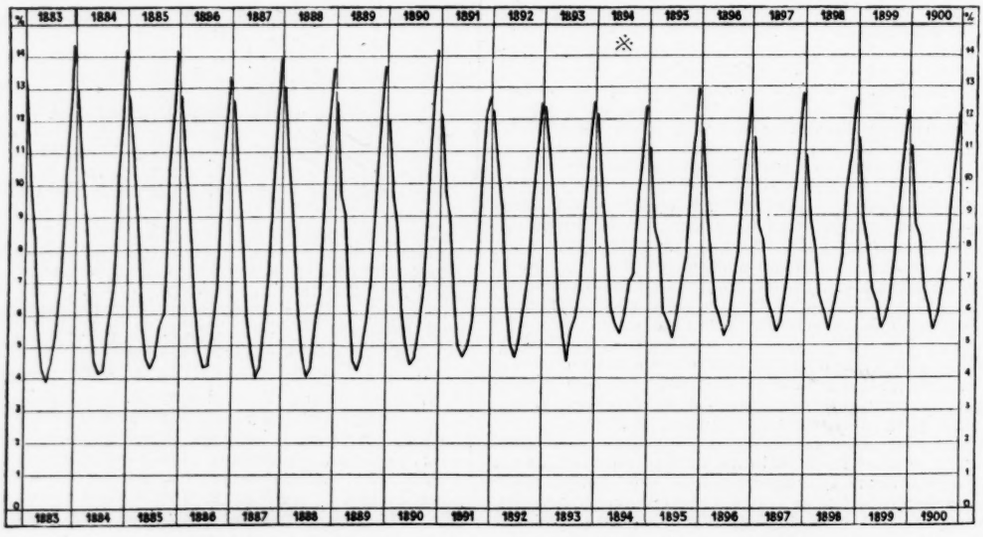
Once again recently has the question of differential rates for gas supplied for various uses been brought prominently to the attention of gas men by the reversion of some towns—of which Berlin is the most notable example of late—to a uniform price for gas, whether supplied for illuminating or other purposes. This uniform price is lower than that formerly charged for gas for lighting, but higher than that for gas for heating purposes. Moreover, in the "Journal für Gasbeleuchtung" Herren Muchall and Merz, in separate communications, have lately advocated, not a uniform price for gas consumed for every purpose, throughout the year, as has been adopted at Berlin, Charlottenburg, Spandau, and elsewhere, but one uniform price for the winter and another for the summer. Herr Borchardt has still more recently discussed the same matter. The whole question of the expediency of charging two distinct prices for one and the same description of gas, has therefore been raised anew.

The arguments which are brought forward in favour of a uniform price are so well known to gas men, that it is unnecessary to occupy time with a recapitulation of them. The chief is that the necessity for the duplication of services and meters is avoided when there is only one price for all the gas sold. Likewise the arguments brought forward, in the communications named above, in favour of a distinction between the summer and the winter price, need not be repeated. The author will rather endeavour in the present instance to expound his personal views, which are based on experience gained at the works of the German Continental Gas Company, and on observations of rate reforms in other towns. But before attempting this, he would again point out what has been so often demonstrated before—that the question of gas-rates cannot be settled by reference to any general prescription. In no other matter connected with gas business are local conditions of so great significance. "Local conditions" is not used so much in the general sense of the term, as with reference to already existing conditions, whether these have been evolved from former rates or from established contracts between the municipalities and companies at the particular places. These conditions differ everywhere. Hence it is clear that, if at the present time gas lighting were being introduced in some place, the question of gas-rates could be settled far more easily, and perhaps also more effectively, than in a case where the consumption has fallen into a particular groove in consequence of the existence for years past of differential rates. It must, therefore, be the author's task to proceed at first only in a negative manner, and to set forth plainly the considerations which, with most works, stand in opposition to any general adoption of a uniform price for the whole year. The author's chief misgiving is that the use of gas for technical purposes on a large scale—*i.e.*, for gas-engines, for heating irons in large works, and in the textile industry—will be considerably diminished, if not wholly stopped, by the adoption of the uniform rate for gas. And the misgiving extends, though in a lessened degree, towards the uniform rate with the additional provision of a different basis for the summer and the winter.

In the first place, it appears desirable to point out afresh the great importance to the gas industry of the consumption of gas by gas-engines. For instance, taking for example, as a basis, a consumption of 2650 to 2800 cubic feet of gas for a private consumer's burner for lighting and for a cooking or heating burner, on the other hand a gas-engine consumes for each horse power on the average over 35,000 cubic feet. Further, this consumption of gas for heating and power purposes, as is well known, not only occurs for the most part in the daytime—though there is a certain amount of overlapping in the evening hours—but throughout the year. In most cases, moreover, it takes place in an almost ideally uniform manner, as has been pointed out by Herr F. Schäfer in recent writings. While in the "Journal für Gasbeleuchtung" it has been held that, as soon as electro-motors, with their extraordinarily great advantages, are available in small industries, gas-engines must be relegated to the background, and be regarded as less economical, the author regrets that on this point he is of quite another opinion. He does not think it worth while to question the advantage of convenience, and the superiority in respect of small capital outlay for the installation, on the side of electro-motors; but, on the other hand, in by far the greatest number of cases the working charges are very much lower with gas-engines of all sizes (but especially with those of 3 to 4 horse power) than with electro-motors. Thus, assuming that gas costs 3s. 5d. per 1000 cubic feet, and electric current 2·4d. per kilowatt, the gas consumption costs less than half the consumption of current—both for a 12-horse power engine. But regard must be had to the fact that with the electro-motor there is a smaller capital outlay to be redeemed. In the author's opinion, the greatest economy rests absolutely with the gas-engine. This is the more true, because the relatively cheap working of the electro-motor is only achieved through electricians having from the outset, not only laid separate connections for the supply of current for technical purposes, but disposed of current for such purposes at a price which differs to a far greater extent from the price charged for current for lighting purposes than the prices of gas for the two uses differ from one another. The price of current for technical uses is, indeed, often so considerably below the cost of production, that in many towns the managers of the electricity works earnestly desire to have this uneconomical reduced price raised again.

While with gas the difference between the prices charged for that sold for lighting and that sold for other purposes is, on the average, only 25 to 30 per cent., the similar difference in the prices at which electric current is sold averages about 66⅔ per cent.; or one price is more than double the other. Nevertheless, the cost of current consumed by a motor remains about double that of the gas consumed in a gas-engine. Consequently, on the broad issue of economy (especially of economy to the community at large), it is clear that the gas-engine is not inferior, but considerably superior, to the electro-motor. Only those towns are to be excepted from this generalization in which quite special conditions prevail for the production of electric current—as for instance, those where extremely cheap water power reduces the cost of current to an exceptional extent. Consequently, if a uniform price of (say) 3s. 8d. or 4s. per 1000 cubic feet for the

Diagram No. 1.—*Gotha Gas-Works. Percentage Distribution, among the several Months, of the Output of Gas during the Years* 1883 *to* 1900.



* Introduction of a lower summer price for gas used for heating and power purposes.

DIAGRAM No. 2.

PERCENTAGE DISTRIBUTION, AMONG THE SEVERAL MONTHS, OF THE OUTPUT OF GAS FOR LIGHTING (L), TECHNICAL (T), AND ALL PURPOSES, AT TEN WORKS OF THE GERMAN CONTINENTAL GAS COMPANY OF DESSAU.

YEAR 1883.—*Proportion of* T *on the Total Output of Gas* = 3·66 *per Cent.*

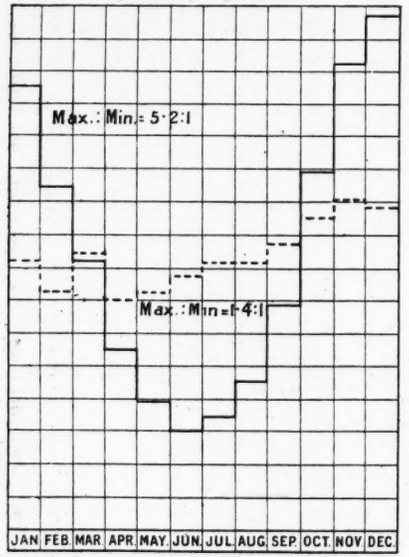


FIG. 1.

YEAR 1900.—*Proportion of* T *on the Total Output of Gas* = 33·09 *per Cent.*

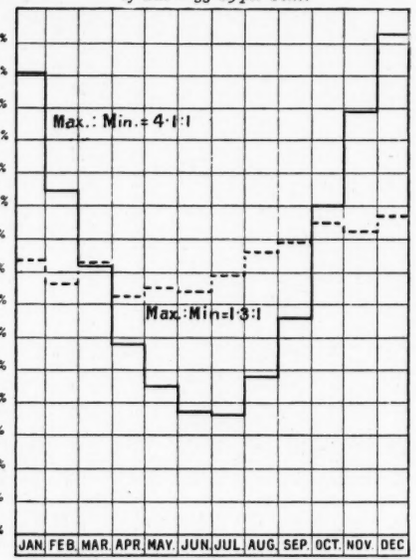


FIG. 2.

TOTAL OUTPUT OF GAS.

YEAR 1883.

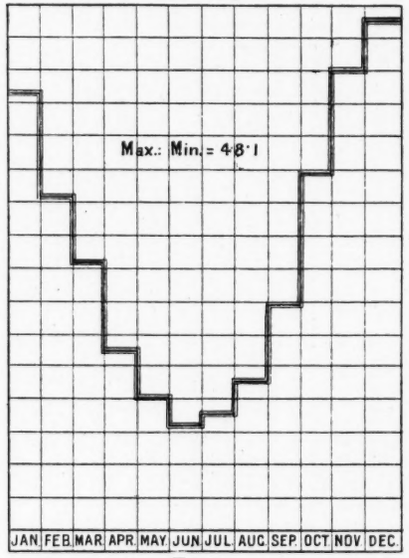


FIG. 3.

YEAR 1900.

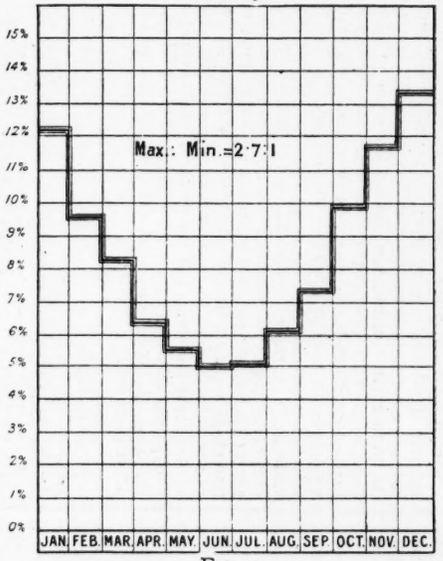


FIG. 4.

whole year is introduced, while at the present time large consumers of gas for other than illuminating purposes obtain it at 2s. 10d. or even 2s. 3d. in some places, it is clear that the introduction of the uniform price will deter the best friends which the gas industry has—viz the owners of gas engines—from extending the use of this form of power. It will at least, having regard to the competition of electro-motors, render it very difficult to secure new installations of large gas-engines. The same argument is also valid, though perhaps less forcibly, with reference to the proposal for one uniform price for the summer and another for the winter half year. It must not be supposed that, with a winter price of 4s. 3d. or 4s. 6d. per 1000 cubic feet, there will be a considerable extension of the consumption by gas-engines, provided the summer price amounts to 3s. 5d. Even this summer price is much too high for the consumption by large engines, &c.; while the winter prices named are about 40 per cent. above the customary price of gas for power purposes.

In addition to the two systems of rates for gas already named, there must also be mentioned a third which aims at securing the advantages of uniform prices for the winter half year and for the summer half year; while retaining the large consumers of gas for other than illuminating purposes. This system adopts the lower summer price for gas as the standard price for gas for power purposes in the winter also, in all cases where separate services and meters are provided. Thus there are in winter, as generally at present, two prices, but in the summer only one price for all gas sold. Nevertheless, this places the gas-works also in the position to grant a rebate for large engines on the price of gas for power purposes, which is thus maintained uniform throughout the year, while not compelling them to go so far in this direction as electricity works go. The author holds the opinions already expressed by Herr Merz, of Cassel, against making a difference in price for gas each month, as the results achieved by this system have hitherto been in no way superior to those secured by the ordinary dual-rate method, while a change of price each month entails more accountants' and clerical work.

The proposition, previously made by the author, that the uniform summer price should be applied to large technical consumers in the winter also, is confronted with many difficulties as soon as an attempt is made to apply it forthwith. This is illustrated by a circumstance in connection with the author's Company. Nearly all the managers of the works of the Company are in sympathy with the proposition in principle. Nevertheless, in particular instances, its immediate application has been prevented owing either to the terms of already existing contracts, or special conditions of sale. It has fared similarly at other works, when closely investigated. But the author's counsel would be the same with regard to every mode of fixing prices—*i.e.*, to aim foremost, by means of dual prices, at securing that the gas sales to consumers for engines and for large industrial uses shall not only be maintained, but even considerably augmented.

Reverting now to the main question, it is desirable to state what are the reasons which at the present time, after more than thirty years' experience, are in favour of the system of dual prices, and what are its underlying principles. While not desiring to speak *pro domo*, the author must point out that his Company claim the credit of having, in the year 1862, taken the lead with the introduction, at their works in Germany and abroad, of a reduction of about 25 per cent. on the price of gas sold for technical uses. Nevertheless, this clearly would not have prevented the Company, if they had experienced bad results from it, from reverting to a better system of rates for gas sold. Their experiences, however, have been so favourable that the author desires to call attention to them as shown in the diagrams annexed. In these, gas sold for lighting purposes is designated L Gas; that sold for technical uses in general, T Gas; that sold for heating purposes only, H Gas; and that sold for power purposes only, K Gas.

Diagram No. 1 shows the development of gas consumption in the town of Gotha, under the dual-rate system. At the first glance, it is apparent that the fluctuation of the monthly outputs of gas has gradually become easier, as the crests and depressions of the curve have become shallower—more especially since the year 1894, when a lower summer price was introduced for gas used for technical purposes, but not for gas for lighting. But that a system of dual rates in force uniformly all through the year has a very decided effect in equalizing more and more the differences in the monthly consumptions during the year, is clearly

and distinctly shown in Diagram No. 2. Figs. 1 and 2 in this diagram show the apportionment, in percentages, of the gas sold for lighting and that sold for technical purposes, so far as the latter was measured by separate meters, during the years 1883 and 1900. In the first place, it is to be remarked how uniform is the consumption of gas for technical purposes throughout each of the two years. It is not surprising that the uniformity of the consumption for technical purposes is not quite perfect throughout the year, for the consumption of new customers that year makes itself felt by the autumn in an increase of the consumption for those purposes. But in the output of gas for lighting also there appears a small improvement between the years 1883 and 1900. This is to be traced to a large portion of the gas sold at the price of gas for lighting purposes having been applied for cooking and heating. The curve for lighting gas has thus also had the large differences between the months lessened for this reason; and the same annual output of gas has, in this manner, been attained with a smaller gas plant, and therefore with a diminished capital charge.

The improvement, however, appears quite striking when the total output of gas of the Company for the year 1883 is compared with that for last year, as is done in figs. 3 and 4 of Diagram No. 2. While in 1883 the maximum consumption (in December) is more than 4·8 times the minimum consumption (in June), in 1900 it had fallen to 2·7 times. This has been brought about without any special considerations being given to the winter and summer consumptions, but solely through a system of dual rates which makes the price of gas for technical purposes about one-third lower throughout the year. It must, further, be taken for granted that, if this system of dual rates be altered in the future, where contracts and local arrangements admit of it, by making a distinction between the summer and winter consumption, the equalizing of the gas consumption, and therewith the better utilization of the gas plant, will be effected far more rapidly than has hitherto been the case. Diagram No. 1, giving a graphic delineation of the effect of the change at the Gotha Gas-Works, affords a pertinent illustration on this point.

The distinction between winter and summer consumption will at once very greatly diminish the number of the inconvenient duplicated gas-meters and services, and is therefore, the author thinks, to be regarded as most important. A complete abolition of all duplicated services must be put out of consideration, because large gas-engines could rarely be connected to an existing service for lighting purposes without alterations, as it would as a rule be too small for the larger consumption of the engine. The same argument applies also to large ironing works, kitchens, singeing apparatus, &c. But even if the service should happen to be sufficiently large, big consumers of gas for technical purposes would not be able or willing to forego duplicated meters, because they would otherwise lack convenient means of controlling their consumption for such purposes—for instance, for working gas-engines. And it is constantly brought forward as an advantage possessed by the gas-engine over the steam-engine, that its hourly consumption can be so distinctly checked, and that thus not only the efficiency of the system but also the condition of working of the engine at any time can be controlled. The author believes that the duplicated services and meters could not be wholly avoided, if only by reason of the means of control which they afford.

Since, for these reasons, the duplication of services and meters is not wholly avoidable, even with a uniform price for gas, and the whole question of new rates deals only with as great a diminution as possible in the number of such duplications, there should be presented on the other hand, on behalf of the dual system of rates, some statements which the author considers thoroughly refute the frequently expressed view that a lower rate for gas consumed for technical purposes constitutes an injustice towards consumers of gas for lighting purposes. For in any business transaction there are involved, as is well known, not only prices, but stipulations, on the one hand as to the magnitude of the quantity dealt with, and on the other hand as to the period and manner in which delivery is to take place. All gas engineers know that if they give a works an order for pipes or apparatus for the winter, they obtain them cheaper, with the same prices for raw material, than if, for instance, they order them in the spring. But no one has been able to descry an injustice in a coal syndicate conceding lower prices for uniform monthly deliveries than for a sale which extends only to the winter months, or applies in an enhanced degree to them. It is also well known that for a long time spirit has been sold in the denatured (methylated) condition for industrial purposes—*i.e.*, for burning—more cheaply than the drinking spirit or spirits of wine, though the spirit, apart from the denaturing material, is the same for all purposes, and is produced in the same manner. State ordinances in this case create a great difference in price, which at the present time—if ordinary spirit is taken at 150 pf. and denatured spirit at 80 pf. per litre—amounts to about 80 per cent. But, further, the spirit ring have recently adopted the proper commercial principle of cheapening still further "motor" spirit. This is the cheaper by about 16 to 20 per cent.. So that, between spirit for motor purposes and ordinary non-denatured spirit, there exists a difference in price of 86 per cent.; while the extreme difference observed in gas prices is about 50 per cent.

The gas industry, which is carried on entirely from central points, and has to pay interest on an expensive distributing system, in addition to having the central stations, has more than any other to operate with might and main to bring about a better distribution of the year's output—just as electricity works are doing, almost without exception. And for this reason most works have hitherto rightly sold more cheaply for the consumption which induced a better distribution over the year. This action was based on quite correct commercial and economical principles. Only because gas men know that by the wholesale employment of gas for technical purposes—apart from the special uses for heating in winter and for gas-engines for electric lighting—a very much better distribution of output over the year is attained, do they adopt the system of dual rates. According to the author's view, therefore, it is a mistake to demand that gas may be applicable indiscriminately for lighting or other purposes, and that it must be sold at one uniform price, simply because the net cost of manufacture per 1000 cubic feet, so far as wages and raw materials are concerned, is the same. The factor of apportionment of capital—nowhere to be ignored—is also certainly considerably higher in the case of gas which serves for lighting than of that used for other purposes.

(To be continued.)

BRITISH ASSOCIATION OF WATER-WORKS ENGINEERS.

The Sixth Annual General Meeting of the Association was held last week, at Birkenhead, of which town the President for the year, Mr. W. A. Richardson, M.Inst.C.E., is the Corporation Water Engineer. If the members had had their choice of weather for the outing, they could not have had better than they did; and so the week's stay in and around Birkenhead was, up to a certain point, much enjoyed by the fifty or so members who assembled from different quarters of the country. The Mayor (Alderman Thomas Cook) and the Corporation Gas and Water Committee were very cordial in their reception of the Association; but, as will be seen, their generosity was ill-requited—in a way which the members could not control. His Worship and the Corporation kindly placed the Council Chamber and adjoining rooms at the disposal of the Association for the meetings; and, before the first sitting commenced on Tuesday, the Mayor, wearing his chain of office, graciously gave the members an individual welcome at the top of the handsome staircase leading to the Council Chamber. Then passing to the place in which the governing work of the borough is transacted,

His Worship addressed a further welcome to the members collectively. He said that when he accepted the position to which his fellow townsmen invited him eight months ago, he little thought that it would fall to his lot to welcome such a useful body as the water engineers of this country; and it gave him the greatest pleasure to comply with Mr. Richardson's request that he (the Mayor) should welcome them that morning. He had known Mr. Richardson in professional life for above 40 years; and therefore it afforded him some delight to be present on such an occasion as this. Passing on, he said that they could not, if they would, ignore the great value of a pure water supply to their large centres of population; and he did not hesitate to say that, in that part of the country, they were not altogether so easy in their minds as to their future water supply as they would like to be. He spoke of the value, both to the country and to professional men, of such conferences as this; and he trusted that this gathering of water engineers would be eminently satisfactory and profitable to them, and that they would leave Birkenhead and go back to their varied spheres of labour with pleasant reminiscences of their visit.

Mr. C. H. Priestley (Cardiff), the retiring President, briefly proposed a hearty vote of thanks to the Mayor for the kindly disposition he had manifested towards the Association that morning.

Mr. W. Watts (of the Little Don Valley Water-Works of the Sheffield Corporation), in seconding, also thanked his Worship for his words of encouragement and kindly reception.

His Worship having briefly responded, the members turned to the business before the meeting.

Confirmation of Minutes.

The Secretary (Mr. Percy Griffith) read the minutes of the half-yearly meeting, held in London on Dec. 8 last; and they were confirmed.

The New and Retiring President.

Mr. Priestley said a pleasant duty had fallen to his lot. He had had the pleasure of presiding over the Association for twelve months; and now he was going to vacate the chair. It was therefore his gratifying duty to introduce his successor, Mr. Richardson. They all regretted that their new President's health lately had not been so good as it might have been; but they were pleased indeed to see that he was now sufficiently well to be present at the meeting.

Mr. Richardson on taking the chair was enthusiastically received. He thanked the members for the honour they had conferred upon him in appointing him President. He regretted that recently his health had not been such as he could desire; and, as a consequence, he had only been able to prepare a very short address, and not such as he would have liked to put before the members. He hoped the programme arranged would give

every satisfaction. He proceeded to refer to the services in the presidential chair of Mr. Priestley during the past year, and moved a resolution acknowledging them.

Mr. R. H. SWINDLEHURST (Bolton) seconded the motion, which was carried with applause.

Mr. PRIESTLEY, in reply, said that it was with feelings of trepidation that he took the chair twelve months ago; but the way the members supported him at the Cardiff meeting and during the twelve months had been a great satisfaction to him. He had tried to do the best he could for the Association; and he should continue to do so after leaving the chair. He thought they, as water-works engineers, ought to do all they could for the Association. It was composed almost entirely of gentlemen who had charge of works; and it was for themselves and for the good of the country generally that they met together. The health of the country to a great extent depended upon the supply of pure water; and the supply could be bettered, so to speak, by their meeting together, and discussing the various ways in which water was distributed throughout the country. He hoped Mr. Richardson would have as happy a time the next twelve months as had fallen to his (Mr. Priestley's) lot during the past year.

The SECRETARY, at the request of the PRESIDENT, then read the

INAUGURAL ADDRESS.

The President opened his address with a few words of hearty welcome and of thanks for his unanimous election to the head of the Association, and with an assurance that he would most willingly do all in his power to promote its interests. Without further introduction, he entered upon a description of the Birkenhead Corporation Water-Works, which, though not large, afford very interesting details as to underground water, and give a good deal of useful information as to the supply to be obtained from wells. Indeed, this part of Cheshire and the adjoining part of Lancashire have, he says, for many years been wholly dependent for water supply on the water obtained from wells sunk in the new red sandstone. Liverpool was wholly so until it got a supply from the Rivington works in January, 1857, and even then had to continue pumping to a large extent. The very extensive works at Vyrnwy now afford such a supply as to leave the use of the wells a matter of indifference. The Hundred of Wirral and a large part of Lancashire are still dependent on wells for their water supply; Widnes and St. Helens wholly so; and he believes Warrington nearly so.

In Birkenhead there are five pumping-stations—Spring Hill, Flaybrick Hill, and Borough Road (with shafts and boreholes), and the Ford and Mount Road (with only boreholes). Permanent machinery has not yet been put down at the latter works. The water is obtained entirely from the new red sandstone.

The Spring Hill works were opened in 1841, and were purchased from the late Sir William Jackson in 1857 by the late Birkenhead Improvement Commissioners, and came under the control of the President in December, 1881, when he was appointed Corporation Water Engineer. From 1883 to 1886, the following works were carried out: The well, 10 ft. by 7 ft. 10 in., was increased in size to 12 ft. by 12 ft. for a depth of 60 feet, commencing 95 feet below the surface of the engine-room floor. No. 1 borehole was enlarged from 12 inches and 7 inches diameter to 18 inches diameter, starting from the bottom of a shaft 155 feet deep, and finishing 393 feet below the engine-room floor. Borehole No. 6 was widened from 7 inches to 12 inches diameter for a depth of 150 feet, starting in a heading 253 feet below the surface. A borehole 18 inches and 6 inches diameter was widened into a shaft 5 feet diameter for a depth of 70 feet, starting 83 feet below the surface. Headings to the extent of 291 feet were driven 9 feet wide and 6 feet high at a depth of 153 feet below the surface. By carrying out the above works at a cost of about £2000, the yield was increased from 7 million gallons per week to 12 million gallons.

From 1885 to 1888, two single-acting rotary beam-engines and two sets of double-acting pumps were put down. The makers were the late Messrs. James Watt and Co., of Soho, Birmingham. The pumping capacity of each (they were in duplicate) was 90,000 gallons per hour. In 1890 the yield had decreased to 9½ million gallons per week. A 15-inch borehole was sunk 525 feet, starting 153 feet below the surface, at a cost of £255; the yield being increased to 10 million gallons per week. In 1893 the yield had decreased to 7 millions per week. At that time, the machinery consisted of two old beam-engines and three boilers working at 7 lbs. per square inch steam pressure; the yield of the well and the borehole being 7 million gallons per week. In 1894, the Committee decided to lower the well (12 feet square) 120 feet, starting 158 feet below the surface; to drive 300 feet of headings, 6 ft. by 4 ft. 6 in.; to widen No. 3 borehole from 4 to 18 inches for a depth of 446 feet, starting 90 feet below surface; and to deepen No. 5 borehole 110 feet. The work of lowering the shaft was commenced in 1894, and was proceeded with till October, 1895, when the work was stopped; the yield having been increased to 13,600,000 gallons per week, and the supply to the town having been maintained throughout. The lowering of the well is not yet completed. At the present time, a new 24-inch borehole is being sunk a depth of 800 feet below surface, and another borehole, 18 inches diameter and 800 feet deep, will be put down when the 24-inch hole is completed.

The yield is now 8½ million gallons per week. There are seven shafts, six of them being 5 feet diameter, and eight boreholes from 3 to 18 inches diameter; the deepest being 678 feet below the surface. There is at the Spring Hill works a covered service reservoir with a capacity of 800,000 gallons. These shafts and small boreholes all existed in December, 1881.

The works at Flaybrick Hill were designed and carried out by the late Mr. C. F. Bateman, in 1861-2. The well is 15 ft. by 8 ft., and is 205 feet deep. Two boreholes were put down—one 18 inches diameter and 833 feet deep, the second 15 inches diameter by 525 feet deep. Two rotary beam-engines and pumps were put down in duplicate by Messrs. James Watt and Co.; the pumping capacity of each being 64,000 gallons per hour.

In 1881, the yield of water was 14¼ million gallons per week, and in 1891 it had decreased to 7 million gallons per week. In 1891 a borehole was sunk a total depth of 702 ft. 6 in.; the first 489 feet being 18 inches diameter, and the remainder 15 inches diameter. A second borehole was sunk from the bottom of a shaft 180 feet in depth. The depth of the borehole was 516 feet below the shaft; the first 242 feet being 18 inches diameter, and the remainder 15 inches. The result was that the yield was increased to 8 million gallons per week.

There is at Flaybrick Hill a large covered service reservoir, with a capacity of 4,562,600 gallons. Also a tower and tank 50 feet above the engine-room floor. The tank will contain 104,000 gallons.

The Borough Road Pumping-Station was designed and carried out by the late Sir Robert Rawlinson in 1861-2; the President being the Resident Engineer during the construction of the works. One engine was put down capable of pumping about 6 million gallons per week; the yield when the works were completed in 1862 being 2½ million gallons per week. In 1880 the yield was 4½ million gallons per week; a 9-inch borehole having been put down 335 feet deep. The well was afterwards lowered 30 feet; and the yield increased to 7 million gallons per week. In 1891 the yield had decreased to 6 million gallons per week. The well was further lowered 78 ft. 6 in., and 120 feet of headings, 6 ft. by 4 ft. 6 in., were driven; and the yield was increased in January, 1893, to 10 million gallons per week. In 1893 a new compound surface condensing beam-engine and bucket-and-plunger pump was put down, capable of lifting 90,000 gallons per hour. In 1897, the yield was 8 million gallons per week, and at the present time about 6 million gallons. The water from these works is pumped up to service reservoirs about half-a-mile away. The reservoirs are two in number, cut out of solid rock and lined with brick and cement, arched over with brick and concrete. The capacity of No. 1 is 588,550 gallons, and of No. 2, 906,692 gallons. In connection with No. 1 reservoir is a tower 50 feet high, built of solid stone, with a cast-iron tank on top. The capacity of the tank is 40,500 gallons. On the top of a portion of No. 2 reservoir a cast-iron tank has been erected, with a capacity of 62,000 gallons.

In 1896 a borehole was completed at the Ford. The diameter of the first 70 feet below the surface is 31 inches. This was lined with steel tubes. The borehole was then reduced to 24 inches diameter, and sunk to a depth of 800 feet below the surface. The water rose to the surface. An old horizontal engine was put down to test the yield. Working at the full capacity of the engine and pumps, the yield was at the rate of 9½ million gallons per week; the level of the water being lowered to 145 feet below the surface. Up to the present, 3 to 4½ million gallons have been utilized. A contract was placed (and is now in hand) for an air-lift pumping plant in duplicate, to lift the water to a tank at the surface of the ground and force the water from the tank to the reservoir about 1 mile distance, and 200 feet ahead. The air-lift plant consists of compound side-by-side air and steam compressors, and the force pumps are triple expansion. Each set will be capable of lifting 45,000 gallons per hour. The compression plants and force pumps will be so arranged as to be interchangeable in case of breakdown to any single engine; the air-pumps and surface-condensers being also arranged in the same manner. The water and air tubes will be 780 feet down the borehole; thus drawing the water from near the bottom, where it has been proved to be softer than nearer the surface. It is expected to have the first set at work early in August.

The upper portion of this borehole for a distance of about 765 feet is through the red marl, then through a fault into the upper soft red sandstone.

At the Mount Road pumping-station, a borehole (850 feet deep) was completed in 1890. The first 350 feet below the surface is 24 inches diameter; the remainder 18 inches. A second-hand horizontal engine and a pump 19 inches diameter by 6-feet stroke has been put down; but the yield has not yet been ascertained. This borehole is through the new red sandstone.

The County Borough of Birkenhead is a comparatively new creation, having got its Charter in 1877. Up to that time, what was called Birkenhead consisted of the extra-parochial chapelry of Birkenhead and the township of Claughton; the township of Tranmere, under a Local Board, having its own water-works, the township of Oxton, under a Local Board, and part of the township of Bebington, under a Local Board, were included with Birkenhead and Claughton to form the borough which now exists. Oxton and Bebington were then supplied with water by the Wirral Water Company under parliamentary powers; and they still continue to serve that part of the borough.

The adjoining district of Wallasey, and, further to the west, the district of the Hoylake and West Kirby Company, Neston, and the Wirral Water-Works and West Cheshire Companies, all obtain their supply from wells and boreholes in the new red sandstone.

				Gallons.
Birkenhead . .	supplies a population of	108,721,	with an average daily pumping over a period of ten years	2,637,000
Wallasey	,,	51,000,	,,	1,394,471
Hoylake and West Kirby . .	,,	12,000,	,,	386,300
Neston	,,	4,000,	,,	82,192
The Mersey Tunnel* . . .	,,	—	,,	2,400,000
Wirral and West Cheshire . . .	,,	32,100,	,,	953,884
Total . . .		207,821		7,853,847

So that within this part of the Hundred of Wirral, in an area of 25,167 acres, about 207,800 people and all trade requirements are supplied with water pumped from the new red sandstone from the wells and boreholes at the rate of 7,853,840 gallons a day, or 54,976,880 gallons a week.

In the concluding part of his address, the President said that from the water pumped in any district, there is always a question as to what is unnecessarily wasted; and all water-works engineers think the prevention of waste is not easy of solution, as it arises from various sources. Defective fittings, service-pipes too weak, bad plumbing are fruitful sources of waste, and are not easily dealt with, as there is difficulty in getting bye-laws sufficiently stringent and comprehensive to include and prevent defects. An inspection and test of all fittings and materials, and an examination of all services when laid and before being covered up, will be found a great means of preventing waste, at the same time causing less inconvenience to tenants than finding out and remedying defects after defective fittings or services are laid.

Mr. Hamlet Roberts (Ipswich) proposed a vote of thanks to the President for his address; remarking that he had the pleasure a short time since of visiting the various pumping-stations referred to. They were very interesting; and the members would find them quite up to date.

Mr. C. Sainty (Windsor), in seconding the proposition, observed that he was sure he was echoing the feeling of everyone present when he said that they hoped their worthy President would soon be restored to his wonted state of health.

The President, in responding, said the Birkenhead Water-Works were not individually extensive; but there was a good deal to be learnt from them. For instance, the Spring Hill works were, as long ago as 1867, condemned by the late Mr. Bateman as being incapable of further extension, and he said that new works must be erected. They were, however, still doing good service. It was true the water-level had dropped lower; but the water-level all over the country had gone lower. The result of the extension works that had been carried out was that Birkenhead, instead of having an intermittent supply, had a constant service.

New Auditors, Members, and Associates.

On the motion of the President, seconded by Mr. D. M. F. Gaskin (Liverpool), Messrs. W. J. Ware and J. W. Lewis were elected Auditors.

The Scrutineers (Mr. Arthur Andrews and Mr. A. Wells) reported that the result of the balloting was the election of the following new members and associates:—

Members.—Mr. Isaac Carr, of Widnes; Mr. S. C. Chapman, of Jersey; Mr. J. F. Cullen, of Deal; Mr. J. Dewhirst, of Chelmsford; Mr. George Gooch, of Westminster; Mr. J. J. Lackland, of St. Helens; Mr. F. Michael, of Iquiqui, Chili; Mr. H. R. Miller, of Coventry; Professor Henry Robinson, of Westminster; and Mr. H. W. Taylor, of Newcastle.

Associates.—Mr. W. E. Baker, of London; Mr. Neil M'K. Barron, of Warrington; Mr. E. H. Crump, of Nuneaton; Mr. J. Gray, of Warrington; Mr. H. A. Hardcastle, of Newcastle; Mr. C. H. Lawton, of Wirksworth; and Mr. H. J. Winton, of Tunbridge Wells.

LECTURE ON RAINFALL.

Mr. W. E. Plummer, M.A., F.R.A.S., Director of the Liverpool Observatory, then delivered a lecture, to which he gave the title "Rainfall, the Cycle of Precipitation." It was of great length; and we can only give the merest epitome of its contents.

After commenting on the difficulty of arousing interest in the commonplace and frequent phenomena we see in operation around us, he drew attention to the unique position that water holds among liquids. Chemically, it is remarkable for the number of salts it will hold in solution, and the part it plays in chemical combination—for its hardness or cohesion as a compound liquid. Physically, the size of water drops, compared with those of other liquids is remarkable; its treatment of radiant heat and its capacity for heat exceeding all known liquids. Optically, it bends light less out of its course than any other substance. And, finally, it enjoys the unique property of having a state of maximum density at a temperature above freezing-point.

In the next section of his lecture, Mr. Plummer described the difference between evaporation and ebullition. On the question of evaporation, he explained the effect of pressure, of temperature, and of wind. It has been shown, he says, that, with a wind having a velocity of 15 miles an hour, five times as much water is evaporated as in a calm. In England, it is believed, the evaporation varies from 17 to 27 inches a year; and as in some parts the rainfall is not above 24 inches, it follows that the loss from evaporation on a water surface is not very much less than the rain falling directly on the surface. It is well to be reminded of the enormous amount of energy that the act of evaporation requires. In order to obtain a rainfall of 1 inch in 24 hours, a force has to be expended in obtaining the vapour equivalent to more than 90 million tons raised to the height of a mile; and Mr. Laws has proved at Rothampstead that a plant of barley during 172 days' growth, in which it acquired 419 grains of dry organic and 46 grains of dry mineral matter, evaporated not less than 17 lbs. of water—*i.e.*, for every grain of dry matter 257 grains of water are absorbed, and evaporated.

The problem of adiabatic cooling was considered by the lecturer in connection with condensation. He showed how clouds will form at a certain height dependent upon the temperature and pressure. The rate of cooling, he remarked, amounts to 1° for every 183 feet of ascent. The ascending air is replaced by cooler air; and the process goes on until some portion of the ascending air is cooled to the point of condensation, and a small tuft of cumulous cloud appears. Some explanation was offered of the varying size of raindrops; and then the lecturer stated that the general circulation of the atmosphere and the ascent and dynamic cooling of the air in great eddies caused the prolonged rainfall of wet, stormy weather. He pointed out that the American method of atmospheric observations by kite-flying probably gave more reliable results than those obtained on mountain observatories. The records of observations show that, as a rule, the wind steadily increases with elevation. It was also pointed out that Mr. Aitken's researches were responsible for the dust theory formation of rain, but it is now discredited; while, on the other hand, electricity does not seem to offer an adequate explanation. Electrical, chemical, and thermal causes, however, apparently confer upon the air some temporary property by which it acquires an abnormal power of promoting condensation. The lecturer pointed out that, though in Paris they had secured continuous rainfall data extending over 200 years, such records gave no indication that in any special year the average value would be equalled or exceeded. For example, this year we have had a dry spring, and, to maintain the average, we should have a heavy fall in the autumn and winter. But we may have nothing of the kind; and woe to the engineer who makes a calculation on so insecure a basis! Records show that the average amplitude of oscillation in percentage of the total average rainfall is for Europe 16 per cent., Asia 30 per cent., and North America 26 per cent. The average is 24 per cent.—that is, in the driest period, the rainfall is only three-quarters of that in the rainiest. We in England are fortunate in having an amplitude of oscillation less than in any other country recorded; being 18 per cent. Germany has a variation of 23 per cent.; and West Russia 26 per cent. For practical purposes, in the selection of sites for the collection of water, it is important to know the frequency of the rainfalls, and the average amount of single rainfalls. The points on which we ask for information from a gauge are the absolute probability of rain, the probable total duration of rain, and the average rainfall during an hour. But be our information never so great, it will always refer to the past, and will give no assistance in the present or the future.

In conclusion, the lecturer referred to the possibility of producing rain artificially, or of making furious storms of hail to cease. With respect to the latter, he called attention to recent experiments in Italy, which he did not consider conclusive; and with regard to the former he referred to the published opinion of Professor Lodge, who recommended the discharge of electricity into the atmosphere as a means likely to produce rain.

Other matters, of which the lecturer made only passing mention, were the purification of water from pathogenic bacteria, and the examination of the atmosphere for the detection of impurities which could be brought down by rainfall. The lecturer does not think the possibility of contamination by rainfall through the atmosphere has received sufficient consideration. When water is derived from deep wells, such as in the case of the Kent Water Company, the water as it issues from the rock into the fissures and headings of the wells is, in all probability, absolutely sterile; but by the time it has come to the surface and been exposed, it is not, in respect of freedom from bacteria, much superior to the filtered waters of other of the Metropolitan Companies. This is a subject to which, the lecturer thinks, the Association might thoughtfully turn their attention.

On the motion of the President, seconded by Mr. W. Whitaker (Croydon), a hearty vote of thanks was tendered to Mr. Plummer for his instructive lecture—the latter remarking that it was very interesting to find the pure scientist could give them useful information, and could ask water-works engineers to help him in the progress of his special science.

This concluded the first day's sitting.

Papers and Discussion.

The reading of papers was commenced on Wednesday morning, when Mr. William Watt, the Engineer of the Little Don Valley Water-Works of the Sheffield Corporation, gave the first

* At the Mersey Tunnel works about 5000 gallons of water per minute are constantly pumped (salt and fresh water); but from analysis made one-third of this amount is fairly considered to be fresh water. The strata over the above area is chiefly the new red sandstone; but there are about 4500 acres of alluvial and red marl—the remainder being new red sandstone. To Mr. Plummer, the Astronomer to the Mersey Docks and Harbour Board, the President is indebted for the rainfall since 1867. He finds, taking the last ten years ending December, 1900, the average rainfall for the twelve months has been 28·131 inches per annum.

contribution. It was entitled "Detecting and Preventing the Pollution of Public Water Supplies." The discussion on it was as broad and diversified as it was lengthy, so much so in fact that it squeezed into the very brief space left of the sitting the reading of an edifying paper by Mr. W. INGHAM, of Torquay, on "The Design, Construction, and Cost of Service Reservoirs." The members allowed the meeting to be prolonged a few minutes while Mr. Fred Storr, of Wrexham, opened the discussion; and then it was proposed that further debate should be adjourned until Thursday morning. But Fate ruled a longer postponement; the grave misfortune of a few hours later (referred to hereafter) cutting away all hope of usefully carrying on a sitting for technical work on Thursday. The two papers, and the discussion on the first, will be dealt with in succeeding issues of the "JOURNAL."

THE GAS AND WATER COMMITTEE'S HOSPITALITY.

At the conclusion of the sitting on Tuesday, the Chairman (Alderman H. Bloor) and the members of the Corporation Gas and Water Committee entertained their visitors to a sumptuous luncheon in the Town Hall. The Mayor and several of the members and officials of the Corporation were present, among them being Mr. T. O. Paterson, the Gas Engineer. There were a few toasts; and the members of the Association left the Town Hall strongly impressed with the fact that Birkenhead councillors know right well how to receive and entertain a technical organization such as theirs.

THE ANNUAL DINNER ABRUPTLY TERMINATED BY FIRE ORIGINATED BY THE ELECTRIC LIGHTING CURRENT.

The annual dinner of the Association was held on Wednesday night, by the gracious permission of the Mayor and Corporation, in the civic mansion, but was brought to an unpleasant and cruelly abrupt termination. The President sat at the head of the table; and among the guests were the Mayor and several other prominent local gentlemen. The spirit of good fellowship pervaded the assembly; and all were apparently enjoying, with the thoroughness characteristic of such occasions, the relaxation which the function afforded. The toast-list was reached; and it was after the loyal toasts had been enthusiastically honoured that the event occurred which caused a serious (but we sincerely hope only temporary) loss to Birkenhead, and speeded the parting of the festive company and the Council House. It happened in this way: Just before 9.30, a representative of a London contemporary left the Mayor's private apartments, in which the dinner was being held, for the purpose of having a short walk. He entered the ante-room of the Council Chamber, in which the visitors had deposited their coats and hats, and which also contained, affixed to a stand, a considerable number of drawings illustrating Mr. Ingham's paper. Finding the place in darkness, he asked the Hall attendant to switch on the light. This he did, and within three minutes a fire was kindled which ended in such terrible consequences to the magnificent pile. Our own representative had followed his colleague out, and was under the seat of the fire practically at its inception, or perhaps it would be better to say directly after it was noticed by his companion. The ante-room, which is very lofty, is fitted with two handsome electroliers, around which, at the top, were ornamental outlets for ventilating purposes. Almost immediately after the current was switched on, small flames began to arise from the point where the wires enter the electrolier—perhaps (in order that we may not be accused of prejudging any inquiry that may be made) we ought to say evidently through the over-heating of the wire. When noticed, the flame appeared circular in shape, and certainly not so large as an ordinary wash-stand basin. In the hope that the fire would be subdued while still local, it was thought prudent not to disturb—unless danger threatened—the unsuspecting company who were so genially engaged on the other side of the building. The hall attendant promptly proceeded to summon the fire brigade and assistance from other officials. Meanwhile, it was seen that the fire was spreading; and our representative quietly brought from the festal board Mr. C. Sainty, the Water Engineer of Windsor, and Mr. R. S. Lloyd, M.Inst.C.E. (of Messrs. Hayward-Tyler and Co.); and between them they cleared the room of the garments and drawings, and all else that was portable. While this was proceeding, the Hall attendants got out the Hall fire-hose and hand-pump, and at once attacked the seat of the fire. But the difficulty was to get the hose above the ceiling in the ante-room; the only stairway to above the magnificent suite of rooms being one of a trumpery character on the opposite side of the building to the part where the fire originated. However, by the aid of the firemen who had then arrived, they accomplished it; but it was found that the fire had been conducted over a somewhat larger area than had been imagined. It may again be suggested that the burning of the insulation of the wires afforded ready assistance in transmitting the devastating flames. A ventilating-shaft over the room leading into the domed clock tower (which can be seen from many parts of the surrounding country) intensified the activity of the flames. The commotion outside had by this time disturbed the convivial party; and when the firemen saw that they had before them a difficult task, a general order for "all outside" was given, and for all lights to be turned off. The Gas Engineer (Mr. T. O. Paterson), the Electrical Engineer, and the President's son were prominent among the Corporation officials in rendering aid at this stage.

From the small beginning to which we have referred, the fire assumed remarkable proportions and intensity; but fortunately it ascended, and therefore the lower part of the building, which is set apart for the official work of the borough, escaped destruction by fire, but was considerably damaged by water, tons upon tons of which must have been poured into the building. Before an hour had passed, the clock tower was a raging furnace; and the domed roof and superstructure soon succumbed. It was not, however, till about 1 a.m. that the fire was actually subdued.

An examination of the building the following morning, and of the havoc wrought, was a depressing experience. Everywhere the place was damaged by water. Many of the lovely leaded stained glass windows are smashed and twisted. The beautiful Council Chamber has its central plate and stained glass roof and a portion of one of the partition walls wrecked. The upper part of the ante-room is completely burnt out; and in other parts of the same floor the effects of heat, flame, water, and the fallen *débris* are seen. Ascending the wooden stairway to the decapitated tower, the fierceness of the night's work is brought to view. On the way up it was noticed that the joint of a 2-inch gas-pipe had been cleanly severed. But the exploration was a dangerous one; for on one of the landings a fireman was met carrying a comrade who had just been struck down by a falling bar of iron. The huge bells, which had been in the midst of the violence of the furnace the night before, were suspended on their charred oak beams; but they looked forbidding with the nakedness above.

One of the astonishing things is that a building with such a favourable exterior and such solid and beautiful offices and chambers for the governmental work of the borough, should be surmounted by so flimsy an internal wooden structure as was the case here, and that there should only be one small stairway by which to obtain access above the ceilings of the apartments. One of the lessons to be learnt from this catastrophe is that no electric-lighting wires ought to be placed in positions which are not readily accessible. Had the seat of this fire been easy of approach, damage would not have been suffered to the extent (as is computed) of several thousands of pounds.

AN INFORMAL MEETING—A VOTE OF REGRET.

On the following morning, there was an informal meeting at the Woodside Hotel, with the President in the chair.

The PRESIDENT observed that, in consequence of the unfortunate termination of their gathering the previous evening at the Town Hall, it had been thought that the Association should express their regret and sympathy with the Mayor and Corporation. He moved—"That the British Association of Water-Works Engineers attending this meeting tender their sincere sympathy with the Mayor and Corporation of Birkenhead in the serious accident by fire which occurred the previous evening."

Mr. PRIESTLEY, in seconding, said they all regretted very much indeed the circumstances of the previous night; and the sympathy of the members went out very fully to the Mayor and Corporation, and also to their respected President. The kind hospitality they had received at the hands of the Corporation caused the members to feel for them very deeply in their loss.

A further resolution was passed thanking the Mayor and Corporation for their cordial reception and generous hospitality during the stay of the Association in the town; and then acknowledgment was made of the indebtedness of the Association to the Local Authorities and firms who had opened their works for the inspection of the members.

In reference to Mr. Ingham's paper, it was announced that in all probability it would be discussed at the winter meeting, together with a paper by Mr. A. G. Cloake on "French Practice in the Manufacture of Cast-Iron Pipes." In the meantime, written communications on Mr. Ingham's paper are invited.

VISITS TO WORKS.

A conspicuous feature of this year's programme was a solid block of visits to works of professional and general interest; and Tuesday, Wednesday, and Thursday afternoons, and Friday and Saturday were devoted to them. There was no waste time; and each day (thanks to the activity of Mr. Percy Griffith, who allowed no unnecessary loitering) saw the outings accomplished within the allotted hours, without a slighting inspection of any place.

Birkenhead Water-Works, &c.—After the luncheon on Wednesday, a visit was first paid to the Mersey Tunnel Works, where the large air-pumping engines were examined with evident interest. For this treat, the members were indebted to the Mersey Railway Company. Then by brakes the numerous party were conveyed to the Borough Road, Spring Hill, and Flaybrick Hill pumping-stations of the Birkenhead Corporation. Those of the visitors whose acquaintance of Birkenhead only extended to the portion situated near the Town Hall were pleasantly surprised by the beauty of some parts of the country through which they passed, and which considerably added to their enjoyment. The works were sufficiently described in the President's address. In showing the visitors round the works, and in pointing out the interesting features, the President was aided by his son, who is his chief assistant. At the Spring Hill station, the work proceeding at the new 24-inch borehole, which is being sunk to a depth of 800 feet, almost monopolized attention. The boring is being carried out by Messrs. Charles Chapman and Sons, of Salford. At the Flaybrick Hill station, the members were kindly provided with tea

by Mrs. Richardson; and, after their journey, the refreshment was very acceptable. Never, it may safely be imagined, has this station had at once within its grounds such a number of thankful men as were those who acknowledged Mrs. Richardson's hospitality by cheering last Wednesday. Thence the party were conveyed to the Wallasey District Council Water-Works; but *en route* they called upon Mr. Plummer (the morning's lecturer) at the Liverpool Observatory on Bidston Hill, and there, by his kindness, examined, and received explanations as to the use of, the various recording instruments.

Wallasey Water-Works.—On arriving at the Great Float pumping-station of the Wallasey authority, the party were disappointed to find that the Engineer (Mr. J. H. Crowther) was away on parliamentary work. But Mr. J. A. Crowther, who is the official head of another department of the Council, and Mr. H. J. Woodfine, the Chief Clerk of the Gas and Water Department, escorted the visitors, and supplied the necessary information. At this station, the air-lift pumping plant was the object of greatest attraction. It was made by the American Well-Works Company, of Aurora, Ill.; and the system is at the present time the subject of curiosity among water engineers. More and fuller particulars are required concerning it, as it is not thought on this side that, in point of economy, it can compare with ordinary pumping plant. There are, however, situations and circumstances where it can perform a very useful service, such as at these particular works of the Wallasey District Council. Its adoption came about in this way: In 1899, owing to the great amount of chlorines contained in the water raised, it was decided to line-out the borehole (where the plant is now in use), and carry it from 400 feet to 700 feet deep. The diameter of the additional boring was 10 inches. Prior to this alteration, the yield of water was 500,000 gallons per diem; but after the lining of the boring, the yield fell to 146,000 gallons. The quality of the water was, however, very satisfactory; and it was then decided that an air-compressing plant should be put down for the purpose of raising the additional quantity of water, which was known to be available from the boring into the well, at the same time continuing the use of the lift and force pumps as before. This plant, while not being so economical as one would desire—due, Mr. Crowther says, to no defect in the plant itself, but rather to the special and disadvantageous conditions under which it was necessary to instal it—performs its functions admirably, and enables the Council to augment their supply from this source in a manner unobtainable by any other system of working. The air-compressor is of the horizontal tandem type, with duplex steam and compound air-compressors. The boiler power obtainable is only 40 lbs. per square inch; so that the steam portion of the plant is not compounded, nor has a condenser been installed. The steam-cylinders are each 16 inches diameter by 20-inch stroke, and the air-cylinders 16 inches and 9 inches diameter, respectively, by 20-inch stroke. The air-tube is 1½ inches diameter, and is carried down the bore to a depth of 380 feet from the surface. The working air pressure is about 138 lbs. per square inch; and on a test made at a speed of 45 revolutions per minute, the rate of discharge reached 750,000 gallons per day of 24 hours. The plant was erected in 1900, and has worked continuously since then without trouble. The beam-engine working in conjunction with the plant is simple (jet) condensing, with a steam-cylinder of 36 inches diameter and 6-feet stroke. The lift and force pumps are each 17¼ inches diameter by 3-feet stroke. At the speed at which the engine can be run, it is equal to a delivery of 475,000 gallons per day of 24 hours; so that it is only necessary to run the air-compressors at about 25 revolutions per minute, in order to provide the pumps with this quantity of water. This, of course, is not an indication of the extent of the station; but merely some particulars of the portion which principally engaged attention during the visit.

Conveyed next to the Liscard station, the members saw there some of the work carried out by one of their Past-Presidents, Mr. H. Ashton Hill, who was Mr. Crowther's predecessor in the occupancy of the engineership. Immediately adjoining the works, a second pumping-station is in course of construction. One borehole has already been finished; and a second is well on towards completion. No. 1 borehole is 33 inches diameter for a depth of 320 feet (all of which is lined-out), 20 inches diameter from 320 to 600 feet, and 15 inches diameter from 600 to 800 feet. No. 2 bore is 33 inches diameter down to 185 feet (all of which is lined-out), 29 inches diameter from 185 to 320 feet, 20 inches diameter from 320 to 600 feet, and from this depth down to 900 feet (the extent of the bore) it will be 15 inches diameter. The engine will be of the horizontal (tandem) compound surface-condensing type, with high-pressure cylinder 32 inches diameter by 5 ft. 6 in. stroke, and low-pressure cylinder of 58 inches diameter by 5 ft. 6 in. stroke. There will be two single-acting lift pumps to work in the boreholes at a depth of 300 feet from the surface, with buckets of 18 inches diameter by 6 feet stroke, and one double-acting force pump (tandem with steam cylinders), 19 inches diameter by 5 ft. 6 in. stroke.

Plans have been prepared for a second L-shaped covered reservoir, which it is proposed to construct on Gorse Hill, New Brighton, adjoining the existing reservoir. The dimensions are 132 ft. by 92 ft., and 181 ft. by 120 ft., by 21 ft. deep; and when full it will contain 4½ million gallons. A tower will also be erected adjoining the reservoir to supply the higher parts of the district.

For the year ended Dec. 31 last, the quantity of water supplied in the district was 578,331,553 gallons. The average per day, based on a population of 50,000, was 1,584,470 gallons.

Shipbuilding and Port Sunlight.—The Liscard pumping-station completed the inspections on Tuesday afternoon, which was, as will have been gathered, well packed. On Wednesday afternoon, the programme of visits turned the thoughts of the members from the matters appertaining to their daily business life to interests of importance in the outer world. They first wended their way to Laird's great shipbuilding yard, and spent a happy hour or more in expanding their knowledge of the work carried on in a sister branch of engineering and construction. They also inspected the firm's boiler shops, and then a 45 minutes' ride brought them to that world-renowned spot known as Port Sunlight, which has been built up by the enterprise of Messrs. Lever Brothers. The works, the character of the operations conducted there, and the picturesque village which has grown up under the fostering care and liberality of the founders of the firm, are all too well known to need description here.

Warrington New Water-Works.—The members left Birkenhead early on Thursday afternoon, in order that they might have an opportunity of making a thorough inspection of the Winwick and High Warren works and reservoirs of the Warrington Corporation, of which Mr. James Deas, one of the members, is Engineer. They proceeded to Warrington by train; and were met by the Mayor and members of the Water Committee, who accompanied them in the brakes to the various places visited. Mr. Deas made very profitable provision for the comfort of his colleagues. The party devoted their time mainly to the works which are now being constructed at an estimated cost of £247,000. The new works comprise a pumping-station about 1½ miles east of Winwick, with a pump well 12 ft. 6 in. diameter and 160 feet deep, at the bottom of which an adit 6 ft. high by 4 ft. wide is being driven in a north-easterly direction for a distance of about 1200 yards, there being three working shafts in addition to the pump well. The contract price for the well and heading is £24,400. The buildings will comprise an engine-house 50 ft. by 35 ft., boiler-house 50 ft. by 19 ft., coal-shed 50 ft. by 19 ft., and workshop and store 50 ft. by 15 ft. The water from the new well will be lifted, by means of a triple-expansion vertical receiver engine actuating two deep-well pumps 18 inches diameter and 3 ft. 6 in. stroke, to a cast-iron tank under the engine-room floor; and thence the water will be delivered by means of force pumps through 1½ miles of 20-inch cast-iron rising-main to the Winwick reservoirs. The buildings are being erected large enough to allow of the duplication of the machinery. The engines and pumps are to be capable, running at normal speed, of raising 3 million gallons of water per 24 hours against a head of 250 feet. The plant is being supplied by Messrs. J. Simpson and Co.; the contract price being £11,175. The pipes and specials for the rising main are being supplied by the Staveley Coal and Iron Company, at a contract price of £4330.

At Winwick the service reservoir accommodation is being increased by a new reservoir 215 ft. by 190 ft., and 20 ft. depth of water. Its capacity is 4½ million gallons. It is entirely of concrete; the roof being formed of concrete arches supported on eleven cross walls. The work in progress afforded the members an excellent example of the use of expanded metal in concrete. The contract for the reservoir has been let at £22,000. A 27-inch Venturi meter will be fixed on the service main to the town.

An entirely new service is being put down for the higher parts of the district of supply; and a pair of Worthington pumps are being fixed in a new engine-house close to the Winwick service reservoirs for this purpose. The engines are being constructed by Messrs. J. Simpson and Co., at a contract price of £2954. They will deliver into a new high-level service reservoir at High Warren, which is circular in plan, 126 ft. diameter at top-water level, 16 ft. deep, and of a capacity of 1¼ million gallons. The floor, walls, and roof are of concrete, the roof being supported upon cast-iron columns, carrying rolled-steel joists and arched steel channels, and expanded metal sheeting. A dwarf wall runs across the reservoir, so that one half can be used for supplying the district while the other half is being cleaned out. The contract price for this reservoir is £6748. The rising-main to the reservoir, and the service-pipes to the town, have been supplied by the Stanton Iron-Works Company, at a cost of £6700. Where the main passes under the Manchester Ship Canal (in a subway), it is formed of lap-welded steel pipes, 10 inches diameter, tested to 500 lbs. per square inch *in situ*. These were supplied by Messrs. T. Piggott and Co. All the cast-iron pipes throughout the works have solid lead joints, no yarn being used; and in the case of pipes 18 inches and upwards in diameter, the whole of the joint is poured.

New works for the trade supply consist of a storage reservoir of a capacity of 170 million gallons on the Daresbury brook, utilizing a watershed of 940 acres. This will be formed by an earthern embankment 800 yards long, and 65 feet maximum height. There will be the usual tunnel outlet, and a line of pipes conveying the water to the existing filters at Appleton. The estimate for this reservoir is £100,000. At Appleton two new filters and a service reservoir will be constructed; and the existing filters will be reconstructed.

On leaving the High Warren reservoir, the members visited, by permission of the Water Engineer of the Liverpool Corporation (Mr. Joseph Parry), the Norton water-tower.

St. Helens Water-Works.—The whole of Friday was given up to an excursion to St. Helens, to inspect the Corporation water-works. On arriving at the town, brakes were waiting to convey the party to the Eccleston pumping-station, the Brown Edge water softening works, and the Whiston pumping-station. At the

first-named station, 500,000 gallons per day are pumped. At the water-softening works, 2,500,000 gallons per day are treated; the water being received from the Knowsley and Kirkby pumping-stations. At Whiston, the quantity of water raised is 500,000 gallons. Journeying on to Prescot, luncheon was served at the Royal Hotel. Visits were afterwards paid to the Knowsley and Kirkby stations, at which the quantity of water raised is respectively 1 million and 1½ million gallons. At the latter works, tea was kindly provided by Mrs. Lackland, wife of the Corporation Water Engineer. The station in course of construction at Melling was afterwards inspected; and by the courtesy of Mr. J. J. Lackland, the plans and engine design were exposed for examination. During the visit, the members had the satisfaction of being joined by the Mayor (Mr. J. Forster) and the Chairman of the Water Committee (Mr. F. R. Dixon-Nuttall).

The New Hooton Pumping-Station.—On Saturday the members who were able to stay inspected the new works of the West Cheshire Water Company at Hooton which have lately been completed, under the engineership of Mr. Isaac Carr. A description of these works appeared in the "JOURNAL" for the 4th ult. Sight-seeing engaged the rest of the day.

From the foregoing, it will be seen that the members allowed themselves little spare time, and that, from the technical point of view, the week was fully and profitably occupied.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by correspondents.*]

The Autumn Meeting of the Institution of Gas Engineers.

SIR,—In view of the difficulty that will be experienced in obtaining hotel accommodation, in both Edinburgh and Glasgow, during the months of August and September, I shall be glad if you will make the following preliminary announcement with regard to the meeting of the Institution in Edinburgh on Monday, the 2nd of September.

The Gas Commissioners have kindly consented to entertain the members of the Institution to lunch on the Granton works; either a special train or brakes being provided to convey the members from Edinburgh to the works. Invitations for a garden party in the grounds of Granton House are also to be issued to the members and their friends for the afternoon of the same day; special brakes being in waiting in a defined position in Edinburgh to convey the ladies direct to the house in the afternoon.

Members of the Institution, therefore, who propose visiting Edinburgh on this occasion, and also taking part in the International Engineering Congress to be held in Glasgow on the following day, should make immediate arrangements for their accommodation, either in Edinburgh or Glasgow; the train services between the two cities being convenient for taking members to and fro during the congress week. Perhaps the better plan will be to secure accommodation in Glasgow, if possible, as this will be more convenient for those attending the evening functions, though special trains are to be run from Glasgow to meet the convenience of those residing for the time being outside that city.

Edinburgh, July 13, 1901. W. R. HERRING, Chief Engineer and Manager.

Fourteen-Candle Gas.

SIR,—I should be obliged if any of your readers could give me a list of articles that have appeared in the "JOURNAL" bearing upon the subject of the economic photometric figure for light, heat, and power supply of town's gas. Who made the first suggestion to reduce the gas from 17 to 12 or 14 candles? And what reasons were advanced for such a change? A discussion on this subject would be very useful just now.

July 9, 1901. RETORT-LID.

Welsbach's Belgian Patents.

SIR,—We regret to have to trouble you again; but, as you have commented upon our letter to you of the 8th inst., it is necessary that we should do so.

We should not have written that letter to you had it not been that, in addition to the report that we there referred to, there appeared in your issue of June 4 a paragraph headed "The Validity of the Belgian Welsbach Patents," in which it is clearly stated by your correspondent, that the 1892 patent has become void together with the older Welsbach patents. As the Belgian 1885 patent does not expire until 1905, this clearly conveys a false impression; the actual fact being that the 1892 patent now expires in 1905 together with the 1885 patent. Your correspondent's further statement, to the effect that "the monopoly of the Auer Company is thus at an end, at least, for the present," is also, therefore, inaccurate, and not borne out by the facts.

Victoria Street, S.W., July 15, 1901. FAITHFULL AND OWEN.

[It is a pity our correspondents did not write the above letter instead of the one which occupied our space so unnecessarily last week. It is now apparent that the report (which they wrongly last week described as an "article") in the "JOURNAL" for June 25 does not contain the matter which they wished to disclaim, but the concluding lines of a paragraph which appeared in the "JOURNAL" for June 4, and which was quoted as a statement made by a correspondent. "We are not responsible for opinions expressed by correspondents."—ED. J.G.L.]

PARLIAMENTARY INTELLIGENCE.

GLEANINGS FROM THE COMMITTEE ROOMS.

Nearing the End. The preambles of the South Metropolitan, Mond, and Golborne Gas Bills have now been proved a second time; and they will, therefore, soon take their position among the statutes of the land. The Newport (I.W.) Gas Bill has been withdrawn from the consideration of the Committee to whom it had been referred; the expected agreement having been arrived at with the Local Authority, who were opposing. The preamble of the Barrow-in-Furness Corporation Water Bill (the proposals of which were noticed when it was before the Lords) has now been declared proved by a Commons Committee.

South Metropolitan Gas Bill. The South Metropolitan Gas Bill, the objects of which are the raising of additional capital, the conferring of power on the promoters to carry out the recommendation of Sir James Rankin's Committee as to the transfer of the Nine Elms Gas-Works from the Gaslight and Coke Company, and (among other matters) to empower the offering of stock exclusively to private consumers and employees of the southern Company, has passed the Lords Committee before whom it came last Thursday and Friday. Nearly all the Local Authorities north of the Thames appeared in opposition. As readers are aware, their objection to the transfer of the Nine Elms works is that, unless otherwise ordained, the transfer will enable the Gaslight Company to charge a higher price than at present for gas used on the north for public purposes. The price being governed by the lowest charge to any consumer, and the Gaslight Company's consumers on the south side of the Thames having the legal right to gas at the same price as the South Metropolitan consumers, the Authorities north of the Thames enjoy a big advantage. This they are loth to let slip; and hence their antagonism to the South Metropolitan Bill. The Bill passed the Commons Committee, after the "old, old story" had been told in its fullest detail, with a proviso to the transfer clause that the agreement to purchase should not have effect unless the Gaslight Company obtained, in the ensuing session, powers to raise additional capital; that the Act authorizing the additional capital should define the manner in which the money to be paid by the South Metropolitan Company to the Gaslight Company is to be applied; and that all moneys which the Company received from any local authority for public lighting in excess of that which would have been charged but for the transfer of the undertaking should be applied to a reduction in the price of gas to the private consumer. The whole transfer proposal is objectionable to the Local Authorities on the grounds stated; but the last clause of the proviso was particularly obnoxious, as in the event of the Bill passing, it would have rendered futile any endeavour on their part (when the Gaslight Company were again before Parliament) to retain their cherished advantage. Their Lordships passed the preamble, but they expunged the last clause of the proviso; and in that act the opponents found a crumb of comfort.

The Mond Scheme. The Mond Bill had a comparatively easy passage through the Lords Committee at the end of the week. The room presented a very different appearance from the scene when the measure was before the Commons Committee. Then there were a large number of opponents; and the ample table would barely accommodate the numerous Counsel engaged. At the present stage of the Bill, the opposition was reduced to one—viz., the Walsall Corporation; and two of the prominent younger members of the Parliamentary Bar (Mr. Wedderburn, K.C., and Mr. W. L. Williams) represented this solitary opponent. Some of those who were antagonists in the Lower House had voluntarily withdrawn; feeling that, as the scheme now stands, they have not much to fear from it. In other cases, the promoters had agreed with their adversaries during the interval. Perry Bar and Handsworth—residential suburbs of Birmingham—had been clipped out of the scheduled district, because, first, there were no big fish worth angling for there, and, secondly, it was an easy way of getting rid of the antagonism of the Birmingham Corporation. Then Smethwick, West Bromwich, and other places had come to terms; but what satisfied them did not square with the views of Walsall, and so they opposed. Their request was that their district should be left entirely out of the scheme. The evidence given in support of the Bill was much the same as in the Commons; but the cross-examination was reduced to narrow limits when compared with the all-round bombardment to which the sitter in the witness chair was exposed in the Lower House. Lord Kelvin and some manufacturers from Walsall (the latter of whom probably know as much about Mond gas as the hypothetical tenant of the moon) imparted a little freshness to the case for the scheme. At the conclusion of the arguments on Friday, Lord Hatherton announced that the Committee were prepared to pass the Bill, subject to a condition being embodied binding the Company to put themselves in a position to supply Walsall by a given date. On Monday, the date was fixed as four years from Jan. 1, 1902.

Leigh's Double Rebuke. If the Leigh Corporation were not convinced when the House of Commons Committee dismissed their claims in connection with the Golborne Gas Company's Bill that they had, by the position they took up, alienated from themselves the sympathies of all independent men who had the facts before them, they must surely do so now after their curt treatment by the House of Lords Committee. The whole story has been set fairly and clearly before our readers; and therefore, as in the case of the two previous Bills, reiteration is unnecessary. The Leigh Corporation did not like their castigation by the Commons Committee; but they were not altogether game for a second appearance in Parliament over the same matter. Counsel, however, naturally advised that they should not allow such a pigmy as the Golborne Gas Company to vanquish them without a further tussle. The General Purposes Committee of the Corporation had a long sitting on the question; and there emerged from it a resolution not to oppose in the Lords. But an extraordinary meeting was afterwards held when a contrary decision was arrived at; and then at a public meeting a resolution to

oppose was carried by the casting vote of the Chairman! And so the Corporation appeared before Lord Hatherton's Committee last week; and the tale was re-told with considerable fulness by Mr. Ram, K.C., and his several witnesses for the Company. No evidence was called for Leigh; but Mr. Balfour Browne brought all his great oratorical powers to the support of their position. But his speech was wasted time and effort; for their Lordships passed the preamble of the Golborne Bill. They, however, expressed the view that Leigh should be allowed to take away the pipes which they laid into the Golborne district after 40 years inaction, and after the Gas Company had declared their intention of applying for statutory powers for the undertaking which commenced supplying gas in 1855. Mr. Wedderburn (who also appeared for Leigh) ventured to inquire if there would be any compensation for his clients. In reply a monosyllable of two letters was emphatically uttered by Lord Hatherton. Next day the Committee gave the Corporation permission to take away their mains within three months of the passing of the Act; the cost of doing so to be charged on the Leigh general district rate.

The Sterilization Clause. The Metropolitan Water Companies who appeared last Wednesday before the Select Committee of the House of Lords presided over by Lord Falkland, were no more successful than they were in the House of Commons in their opposition to the Metropolitan Water Companies (Amendment of Acts) Bill of the London County Council, the object of which, as explained by Mr. Balfour Browne, is to extend the provisions of the "sterilization" clause in the Staines Reservoirs Act of 1896 to the same period as that named in the Government Act of 1899. The clause in the Staines Act was, he said, that, if the undertaking of any of the three Companies specified should be purchased by any public authority within seven years of the passing of the Act, the Company should not be able to bring into account any advantage it might gain from the powers obtained therein. What the promoters proposed was that the period should be extended for three years beyond the date fixed in the original Act. The question had been before Parliament in a great number of cases, and the sterilization clause had been introduced into every Water Act of recent years. There was no doubt that the purchase of the undertakings of the Water Companies had been determined upon by Parliament, and every Committee of that body. At the present time, the conditions were not favourable to the London County Council being the purchaser; but there was an absolute concensus of opinion that the water-works of London should be purchased, and upon such terms as existed before recent concessions were made to the Companies. The President of the Local Government Board had stated that the Government had under consideration the question of creating a Trust to purchase the interests of the Water Companies; and promised to introduce a Bill next year. It might be some time before such a Bill could be passed; and if August, 1903, arrived before this was done, the Companies would be enabled to get the value of their undertakings enhanced by the powers granted to them in 1896. After hearing Counsel for the Companies, the Chairman said the Committee would pass the preamble, and allow the Bill to proceed. The clauses were then adjusted, and the Bill was ordered to be reported.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bill brought from the Commons, read the first time, and referred to the Examiners: Derby Corporation Bill.

Bill read a second time and committed: Biggleswade Water Board Bill.

Bills reported, with amendments: Bradford Corporation Bill, Burton-upon-Trent Corporation Bill, Metropolitan Water Companies (Amendment of Acts) Bill, South Metropolitan Gas Bill.

Bills read the third time and passed: Aldershot Gas and Water Bill, Bury Corporation Bill, Winsford Urban District Gas Bill.

The Kirkcaldy and Dysart Water Order Confirmation Bill, to confirm a Provisional Order under the Private Legislation Procedure (Scotland) Act, 1899, was brought in by Lord Balfour last Tuesday, read the first, and deemed to have been read a second time, and reported.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Lords Bills read a second time and committed: Dover Gas Bill, Leeds Corporation Water Bill, Rugby Water and Improvement Bill, Salford Corporation Bill, Stockport Corporation Water Bill, Water Orders Confirmation Bills (Nos. 1 and 2), Weston-super-Mare Gas Bill.

Lords Bills reported: Barrow-in-Furness Corporation Bill, Gas Orders Confirmation Bill, Harpenden District Gas Bill, Smethwick Corporation Bill, Wisbech Water Bill.

Bills read the third time and passed: Derby Corporation Bill, Faversham Water Bill [Lords], Gas and Water Orders Confirmation Bill [Lords], Gas Orders Confirmation Bill [Lords].

The Newport (I.W.) Corporation have withdrawn their opposition to the Newport Gas Bill [Lords].

The Harrogate Water Bill, Leeds Corporation Water Bill, Rugby Water and Improvement Bill, and Stockport Corporation Water Bill, have been referred to Sir F. Godson's Committee, the constitution of which has been already given.

Bees took possession of a lamp-post in the High Street, Jedburgh, a few days ago, and for some hours defied the efforts of the community to dislodge them. They were eventually attracted to a hive, on which they settled, and were carried off in triumph.

At the last meeting of the Glastonbury Town Coucil, a mortgage on the rates and the revenue of the gas-works was sealed, between the Council and the local bank, for a loan of £30,000 for one year at 4 per cent., for the purpose of paying for the gas undertaking, which came into the Council's possession on the 1st inst.

HOUSE OF LORDS COMMITTEE.

Thursday, July 11.

(*Before Lord* FALKLAND, *Chairman*, *Lord* LONDESBOROUGH, *Lord* NAPIER, *Lord* CARYSFORT, *and Lord* HAMILTON.)

SOUTH METROPOLITAN GAS BILL.

This Bill, which has already passed through all its stages in the House of Commons, is to empower the South Metropolitan Gas Company to raise additional capital and to purchase, by agreement, so much of the southern portion of the undertaking of the Gaslight and Coke Company as is situated in the County of London south of the Thames.

The Counsel for the Bill were Mr. BALFOUR BROWNE, K.C., Lord ROBERT CECIL, K.C., and Mr. ROSTRON. The petitioners against the Bill were the Corporation of the City of London, represented by Mr. LITTLER, K.C., and Mr. A. H. RIGG; the Borough of Fulham, by Mr. SYLVANI MEYER; the Borough of West Ham, by Mr. EDWARD MORTEN; the London County Council, by Mr. FREEMAN, K.C., and Mr. BERNARD WILKINSON; the Borough of St. Marylebone, by Mr. G. J. TALBOT; the Gaslight and Coke Company, by Mr. POPE, K.C., and Mr. NEVILLE; the East Ham Urban District Council, by Mr. FORBES LANKESTER; the Borough of Hackney, by Mr. BEVEN; and the Boroughs of Paddington and Kensington (reserved).

Mr. BALFOUR BROWNE, in opening the case for the promoters, recapitulated his statement before the House of Commons Committee, as reported in the "JOURNAL" for May 14, p. 1316. He said that that House had very carefully considered clause 3, which ran as follows: "The Company and the Gaslight and Coke Company may enter into and fulfil agreements for, and in relation to, such purchase and sale of the Gaslight and Coke Company's undertaking at Nine Elms and the transfer and vesting of the undertaking in the Company." The proviso which had been passed by the House of Commons ran: "Provided that no such agreement shall have effect unless the Gaslight and Coke Company shall have obtained, in the ensuing session of Parliament, from Parliament, powers to raise additional capital; and provided further that the Act authorizing the raising of the additional capital shall define the manner in which the money to be paid by the Company to the Gaslight and Coke Company shall be applied, and shall provide that all moneys which the Gaslight and Coke Company shall receive from any Local Authority for public lighting in excess of that which the Gaslight and Coke Company would have been required to charge but for the transfer of the said undertaking, shall be applied in a reduction of the price of gas supplied to private consumers." The clauses with regard to the sale of stock involved an alteration in the auction clauses as sanctioned by Parliament, but were not for the purpose of altering the intention of Parliament.

Mr. *George Livesey*, examined by Mr. ROSTRON.

Witness repeated the evidence as to the objects of the Bill given by him before the House of Commons Committee. If passed, the Bill would carry out the recommendations of Sir James Rankin's Committee. The amount of capital required by the Company for works, &c., was £1,051,000, made up as follows: For the extension of works in five years, £936,000; for the railway for which powers were obtained by the Act of last year, £25,000; for the land to be purchased, £40,000; and for building houses for the Company's workpeople, £50,000.

Cross-examined by Mr. LITTLER.

Witness said he had felt all along that the Gaslight and Coke Company could not expect to be allowed to transfer the district until they submitted themselves to Parliament.

Mr LITTLER: Why did you not come with a joint Bill?

Witness: There was no necessity for one. The Gaslight and Coke Company were promoting a Bill this session for capital, and we thought it proper and right that we should come also. The Gaslight Company's Bill was thrown out on second reading.

Because Parliament thought they ought not to have any more capital? No. They ignored the recommendations made by Sir James Rankin's Committee.

If they were here as joint promoters with you, we should be able to say that to this Committee?—I dare say you would; but it is not our fault they are not here.

At the present moment, you are asking for power to agree with people who, until Parliament gives them leave, have no power to agree with you?—Exactly.

May I point out that you accepted a Bill with a clause in it which prescribes what is to be done by the Gaslight and Coke Company?—I am not responsible for that clause.

I point out to you the result of this piecemeal legislation. If the Gaslight and Coke Company were here, their Lordships could either reject this Bill, in view of their conduct, or could prescribe such limitations and obligations as they might think reasonable?—This agreement cannot be carried out until the Gaslight and Coke Company come to Parliament.

Their Lordships will see my point. The power which you get, unless Parliament gives authority to them, is useless to you?—Yes.

Why do you want it this year?—It will not involve our coming to Parliament next year.

When the Gaslight and Coke Company come, Parliament will be powerless to impose any conditions on you?—We are ready to accept all the conditions.

Parliament will be unable in the Gaslight and Coke Company's Bill to impose any conditions on you?—What conditions do you want?

There is no hurry about this till next year?—The longer it goes on, the worse it is.

You are no forwarder; you can do nothing?—No.

Have you made any agreement with the Gaslight and Coke Company?—None whatever. There have been no negotiations.

If you were to go to them and make an agreement, and came with a joint Bill, that could be scheduled to your Bill, and Parliament could see what you are doing?—We tell Parliament what we want to do.

Mr. LITTLER: The purchase is to be upon "such terms and conditions as may be agreed upon between the Company and the Gaslight and Coke Company." Does it not occur to you that the Bill empowers you to make any terms you like?

Lord ROBERT CECIL: My friend is now asking the witness a question which he objected to us asking.

Mr. LITTLER: Do you know that every public authority north of the Thames, the City of London Corporation, the London County Council, and the whole of the Metropolitan Boroughs north of the Thames are opposed to this legislation?

Witness: Not all. There are only half the number of petitions there were in the House of Commons.

When people are represented by powerful bodies like the City of London Corporation and the London County Council, they do not go to the expense of appearing otherwise.

Lord ROBERT CECIL: Is my learned friend going to prove that all the public authorities are opposed to this legislation?

Mr. LITTLER (to witness): Do you not know that all the bodies are opposed to it?

Witness: I do not know it. I do not know that the City of Westminster is opposed to it.

I ask you which of them is in favour of it? Are there any larger consumers of gas in London than the public authorities?—I should think the railways are.

Some of them make their own gas and electric light?—Yes.

Taking the whole of the boroughs north of the Thames, do you mean to say there are such large consumers as they are?—The public bodies are an aggregation of small consumers. If one has 5000 lamps, it is really 5000 separate consumers.

If you put it in that way, the majority of the consumers are those whom I represent?—Oh, no. There are 51,788 public lamps supplied by the Gaslight and Coke Company, and they supply 368,476 private consumers.

Then they are a very handsome minority?—No. The 51,788 are only single lights; while each of the 368,476 consumers has many lights.

Do you know it makes a difference of £50,000 on the rates?—The difference in the price now is 1s. Yes, it is £50,000.

Is it not a fact that the principle of public consumption being charged at the lowest price to any private consumer has been recognized in every Gas Bill since 1868?—Yes.

You are now proposing, by a Bill which is not a Bill of the Gaslight and Coke Company, to alter all that?—No; to adopt that.

Is it not a commonly recognized thing in Gas Acts all over the kingdom that the public lamps should be supplied at a lower price than the private consumers?—There are some such cases.

Are there many?—I do not know.

I think I could supply you with a great many. Have you, since this Bill was in the other House, consulted the Gaslight and Coke Company?—Not about anything.

Last year you negotiated with them before you came to Parliament?—Yes.

Their idea of the price is that they ought to have something not far short of £1,000,000?—I think that their idea is a good deal more than £1,000,000.

If they get that sum, they can apply it for all purposes to which they want to apply capital?—We shall never give more than £1,000,000, nor so much; but part of the money must go to replace the works that they give up. Their works at Nine Elms are capable of making twice as much gas at least as is required in the district south of the Thames; and they are making twice as much there. Therefore, they will have to meet the requirements somewhere else, and will have to adopt other works. Part of the £900,000, or whatever it is, will have to go towards additional works.

It has been a grievance of Parliament against the Gaslight and Coke Company that, while you have complied with the requirements of Sir James Rankin's Committee, they have not?—Yes.

If they manage to get this transfer through Parliament, they will be supplied with money for going on in the same way?—No; Parliament can impose conditions.

Cross-examined by Mr. FREEMAN.

Mr. FREEMAN said that, on behalf of the London County Council, he did not propose to repeat any of the questions his friend Mr. Littler had asked. (To witness:) I understand that what you intend to do by this Bill is to carry out certain recommendations of Sir James Rankin's Committee?

Witness: Yes.

You will agree that in the recommendations of that Committee there is no suggestion made as to altering the price charged for public lamps?—No; but it was before the Committee.

Are you aware what districts would be affected if the clause as put into this Bill became law. First there would be the Corporation of the City of London?—Yes.

Then the London County Council?—Yes. They have not much public lighting.

Then the Borough Councils of Bethnal Green, Chelsea, Fulham, Hackney, Hammersmith, Hampstead, Kensington, Islington, Paddington, St. Marylebone, St. Pancras, Shoreditch, Stepney, Holborn, Finsbury, Stoke Newington, and the City of Westminster?—Yes.

Those were represented by two conferences—one at the Guildhall and the other at the County Hall of the London County Council?—Yes; and they all petitioned against our Bill in the House of Commons.

At these meetings, they passed resolutions that, if your recommendation for transferring the southern district from the one Company to the other was allowed, it ought to be upon terms of protecting the Local Authorities in the same way as they are protected at the present time?—Yes.

You do not claim to represent the Gaslight Company?—No.

You do not say they would carry out any of the suggestions which are contained in the clause?—No. I say that they would be madmen if they raised the price to the public lamps.

Do you know that this arrangement as to charging for public lamps was the express terms of bargain which the Gaslight and Coke Company came to with the Board of Trade?—I know all that.

With regard to the auction clauses, witness said they were of general application to gas companies; but the South Metropolitan Company had had larger experience of them than other companies, and they did not work well with them.

The cross-examination by the representatives of the other public bodies followed the same lines as when the Bill was before the House of Commons.

Re-examined by Lord R. CECIL.

Witness said there was no inducement under existing legislation for a gas company to raise more capital than was necessary. As to the auction clause in the Bill, that was for the purpose of carrying out more fully the object of the auction clauses proposed by Parliament.

Lord R. CECIL: The real objection is with regard to the transfer of the Nine Elms district. It has been suggested by Mr. Littler that no condition can be put upon you next year. Is there in any of the petitions a suggestion that any condition should be put upon you this year?

Witness: I think not.

Can you conceive of any conditions anyone could wish to put upon you in reference to the transfer?—No. We are to supply the district on the same terms and conditions as we supply all the rest—that is, by our present Acts.

And if there were any conditions, it is perfectly open to my friends Mr. Littler or Mr. Freeman, or any of the Counsel to the Local Authorities, to propose them?—Yes.

As to the Gaslight and Coke Company, the first part of the proviso to clause 3 enables them to come next year and propose any conditions they purpose to put upon the Company?—Yes.

And you are putting this Bill forward upon the ground that the whole position is saved for the Local Authorities for next year?—Yes.

My friend Mr. Littler put it to you that the present great divergence between the price of gas to the local authorities and to private consumers north of the Thames was in accordance with the principle of all the Gas Acts which have been passed since 1868. Do you know any case in all England where any such difference exists?—Well, it does in Newcastle, I believe.

Is it in accordance with the principle of the Gas Acts that you should find a company charging 1s. per 1000 cubic feet more to private than to public consumers?—No.

Mr. FORBES LANKESTER: You merely mean as to the extent of the difference?

Lord R. CECIL: Yes. (To witness:) As to the general principle that public consumers should be charged at the lowest rate charged by the Company to any private consumer, under no conceivable circumstances would the transfer of the Nine Elms district affect that?

Witness: No.

The point is that the position in that district imposes upon the Gaslight and Coke Company the obligation to charge an exceptionally low price to the private consumers south of the Thames, and this re-acts upon the private consumers north of the Thames. So that they have to charge to public consumers north of the Thames the lowest price they charge to private consumers south of the Thames?—Yes.

Is that paralleled by any gas undertaking in any town in the kingdom, so far as you know?—No.

When the bargain was originally made, the difference was small?—Yes, 2d.

It is now more than 1s.?—Yes.

Lord HAMILTON: With regard to the standard price of gas and its relation to the dividend, what is the standard price of gas in your Company at this moment?

Witness: 3s. 1d. We are paying 5 per cent. now.

Lord R. CECIL: Had Sir James Rankin's Committee before them the question of public lamps?

Witness: Certainly.

Lord R. CECIL: That is my case.

Mr. LITTLER, on behalf of the Corporation of the City of London, then addressed the Committee on clauses 2 and 3, with the proviso. He repeated the arguments against the clauses which he advanced before the House of Commons, and which were foreshadowed in his cross-examination of Mr. Livesey. He was not sure whether, if the clauses were passed, the Gaslight and Coke Company would be bound to come to Parliament at all next year, as the granting of power to the South Metropolitan Company to purchase might, by implication, give to the Gaslight and Coke Company the power to sell. If that were the case, it was a wrong Bill; and if it were not the case, it was a useless Bill. The proviso was absolutely vicious. He knew of no instance where Parliament prescribed to a future session what legislation they should pass; it was absolutely unconstitutional. It was a parliamentary impossibility, therefore, to pass that portion of the Bill; and he was perfectly willing that the Chairman of Committees should be consulted upon the point.

Lord R. CECIL: I am instructed that this has been actually discussed with Lord Morley.

Mr. LITTLER said that, even if Lord Morley had passed it, much as he admired his Lordship's skill, he was not paramount to the principle upon which parliamentary legislation was founded. There was a definite and clear principle that a future Committee of Parliament should not be bound. He therefore asked their Lordships to strike out clauses 2 and 3. No harm was done to anybody by rejecting that portion of the Bill; and he would ask their Lordships to reject it without calling upon his learned friends who were opposing it for further arguments.

The Committee then deliberated in private for about ten minutes. On the re-admission of the public,

The CHAIRMAN said the Committee were of opinion that, so far as Mr. Littler's argument was concerned, there was not sufficient ground for not proceeding further with the Bill.

Mr. FREEMAN then addressed the Committee on behalf of the London County Council. He did not propose to traverse again the ground covered by Mr. Littler, but submitted that it was very undesirable that such legislation should pass at all, as it was a mischievous

precedent and could not be of use, as it could not come into effect till next year. If, however, power to purchase were given to the Company, he asked the Committee to say that nothing in the Bill should alter existing legislation in respect to public lighting in the Metropolis. If that were decreed, he did not know that any great harm would be done. He also asked their Lordships to accept Mr. Livesey's statement in the other House, that the capital required would be £880,000.

Mr. *Haward*, examined by Mr. FREEMAN.

Witness said he was Comptroller of the London County Council, and had to do with the various financial arrangements. He was aware that the seventeen Metropolitan Boroughs held a conference at the County Hall, and were absolutely unanimous in objecting to any alteration in the charge for public lighting. He did not at all understand how the proposed arrangement in the Bill would work. It appeared to him to be an interference with the sliding-scale. If the Company were going to receive £40,000 a year in consequence of the altered arrangement, the shareholders would, in the ordinary course of things, benefit to the extent of 1-7th, and private consumers to the extent of 6-7ths. But the proviso said that the whole of the £40,000 a year was to be applied to the benefit of the private consumers.

Mr. FREEMAN: If their Lordships should pass the Bill, there should be a proviso that nothing in it should alter the existing arrangements with regard to the price charged for public lighting?

Witness: That is so.

And all the part relating to giving the profit to the private consumers should be struck out?—Yes.

You think the auction clauses work perfectly well themselves?—I think so, on the whole.

In cross-examination by Mr. BALFOUR BROWNE, witness said he objected to the stock being offered exclusively to consumers.

Mr. BALFOUR BROWNE: Do you object to our having employees of the Company owning some of our stock?

Witness: No.

Do you see that this is to be done according to the permission of the Board of Trade?—It cannot be done without their consent.

Do you know that the Committee of the House of Commons made a special report upon this very matter to the House under a Standing Order?—They were obliged to do so.

Friday, July 12.

Mr. *Haward* further cross-examined by Mr. BALFOUR BROWNE.

Witness said he was aware that there had been a division on the third reading of the Bill in the House of Commons over the modification of the auction clause, and that the Bill was then passed by 252 votes to 112.

Mr. BALFOUR BROWNE: I understand the County Council generally say that they appear in these rooms to protect the interest of consumers of gas?

Witness: That is so.

Do you think that you are protecting the interests of private consumers of gas when you want to continue a system by which £36,000 or £37,000 is taken out of their pockets for the benefit of the ratepayers?—I do not think that is quite the right way of putting it. The money is not taken from the public.

It is taken from the consumers of gas and goes back to the ratepayers?—It has not been taken from the consumers of gas; it was never given to them.

In further cross-examination, witness said he was aware that, when the bargain was entered into, the whole difference was 2d.; whereas now it was 1s. per 1000 cubic feet. This increase was due to the mismanagement of the Gaslight and Coke Company's affairs.

Mr. BALFOUR BROWNE: The Committee of the House of Commons said that the £36,000 which would be saved to the Gaslight and Coke Company was not to go into their pockets, but to go to the private consumers. Do you not agree that, if there is a saving, it should not go to the Gaslight and Coke Company?

Witness: Certainly; but I am by no means sure it will not do so.

If it is done, is it not right that the private consumer shall have the benefit?—The principle with regard to the charge to public authorities can be justified, and should be continued; and therefore I do not agree that this money should go to the private consumer.

If it is not to go to the public authorities (the ratepayers), should it not go to the private consumers?—Certainly.

The point is that, pretending to come here to defend the rights of the private consumers, you are really defending the claim of the County Council to get this £36,000, or a portion of it?—The County Council appear for the consumers and the ratepayers.

Do you mean to say that it is not in the interests of the consumers to have this £36,000?—I very much doubt whether they will get it.

This is what the Committee found: "The Committee have had the question of the area south of the Thames, supplied by the Gaslight and Coke Company under their agreement, brought very prominently before them, and strong evidence has been adduced to show that the price charged in the northern area by the Gaslight and Coke Company was increased by 1d. per 1000 cubic feet on account of the low price which the Company was by law compelled to charge in the southern area." Do you know that that represents £70,000?—I do not object to the transfer of the southern area on its merits.

In re-examination by Mr. WILKINSON, witness said he objected to the transfer because it would interfere with the charge for public lighting throughout the whole of the north of London. At the present time, the charge for public lighting was practically uniform all over London north and south of the Thames; the exception being a small corner occupied by the Commercial Gas Company.

Mr. WILKINSON: Then the whole of the public is interested in this question of public lighting?

Witness: Certainly. I should like to say that the natural operation of the clause will be that the consumers will get only 6-7th of the £40,000; and that would mean something less than ½d. per 1000 cubic feet off the price of gas.

Now with regard to the auction clauses, your point is that if the stock is issued at a fixed price, it should not be limited to gas consumers and employees?—That is so.

In your view, the 5 per cent. should be 5 per cent. below the nominal price of the stock?—Not quite. It should be 5 per cent. of stock below the market price.

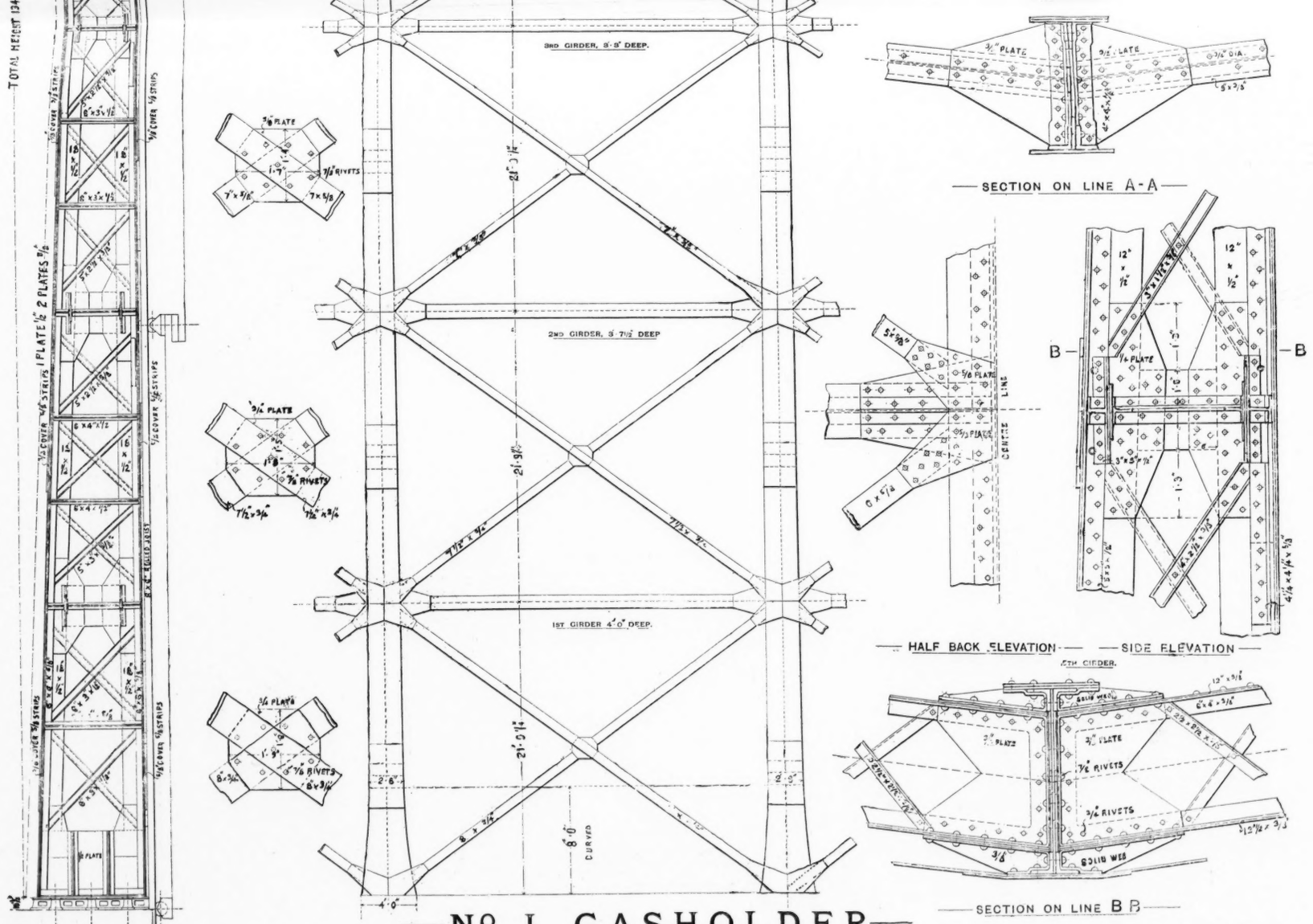
Mr. WILKINSON: That will be the case on behalf of the London County Council.

Mr. FORBES LANKESTER then addressed the Committee on behalf of the East Ham Urban District Council. He said that that authority had a very large district, one-half at least of which was supplied by the Gaslight and Coke Company; and it had had the advantage of the clause in the scheme of 1883 ever since the Council was formed. As to the great questions of principle raised by Mr. Littler, so far as East Ham was concerned, it did not care much about them, so long as the Bill did them no injury. Therefore he did not ask from the Committee any sweeping decision that the Bill could not proceed, but that it should not proceed without a clause protecting the Local Authorities north of the Thames who were interested in maintaining the present price of gas for public lighting in the district. It had been said that Sir James Rankin's Committee had in their minds the consequences arising from their recommendations; and it was true that they referred in one part of their report to the fact that, by the Gaslight and Coke Company handing over their southern district, they would cease to be subjected to the burden they were then suffering from—of having to supply gas on the south of the Thames at a loss. There was also a word which might be taken to refer to the effect on the northern lighting. But it was clear it was never discussed, because, on looking through the evidence, he did not find that a single Local Authority came before the Committee and told them that it would be harmful to them to have their price raised. It was also clear that the recommendation did not say a word about its effect upon the public lighting north of the Thames. The Committee could not have put in a recommendation like that without referring to its effect upon the public lighting north of the Thames, if they had had the point in their minds. When Mr. Livesey, in bringing up his Bill this session, saw the number of petitions against it, at the last moment (in the filled-in Bill) he put in a clause limiting the amount which the Gaslight and Coke Company might charge to the then price which the South Metropolitan were charging—viz., 2s. 8d. per 1000 cubic feet. That went a long way to meet the Local Authorities, because it did stereotype the benefit they were then receiving. But while it provided they could never get less benefit, it prevented them from getting more; and they had said that was not fair. The price of the South Metropolitan Company had already gone down to 2s. 6d. per 1000 cubic feet; and that being the price at which the Gaslight and Coke Company had now to supply the Local Authorities, the latter were already benefited by 2d. per 1000 cubic feet more than when the Bill was before the House of Commons. However, the promoters in that House told them at an early period that they would not put in the clause limiting it tc 2s. 8d., and it was cut out. But the Local Authorities were not going to take the Bill without any limitation; and it was quite clear what was in the minds of the Committee. The intention of the clause was two-fold. First, that the Gaslight and Coke Company should have no advantage that the Committee could prevent until they had submitted themselves to Parliament, with which he was fully in accord; and, secondly, that all moneys which the Gaslight and Coke Company should receive from any Local Authority for public lighting in excess of that which they would have been required to charge but for the transfer should be applied in a reduction in the price of gas supplied to the private consumer. Nobody had pointed out to the Committee the fact which he would point out to their Lordships, that, while the body of ratepayers in some districts was practically the same as the body of gas consumers in others, there was an enormous distinction. It was obvious the Committee had not had this point in their minds, and their object was to make the Gaslight and Coke Company give back, to the public generally, what they got in increased rates from the Local Authorities by a reduction in the price of gas to private consumers, believing that the ratepayers and private consumers were practically the same body. In East Ham, however, the number of gas consumers was not more than one-fifteenth of the number of ratepayers—it being a poor, working-men's district, where practically only the manufacturers and shopkeepers consumed gas. But as he read the clause, what was added to the burden of the ratepayers in a particular district would not be distributed even among the consumers in the district, but would be spread over the gas consumers of the Gaslight and Coke Company over the whole of London, including Marylebone, St. George's, and Westminster. The learned Counsel proceeded to argue that the proviso was of no practical use whatever, as the Company, under the sliding-scale, could not share in dividends the money obtained from the Local Authorities until they had reduced the price of gas to the consumers. He asked the Committee, if they passed the clause, to add the following proviso: "And provided that nothing in this Bill shall enable the Gaslight and Coke Company to charge more for public lighting north of the Thames than they would have been entitled to charge had this Bill not passed." If they got this clause, the public authorities were saved. He would call evidence to prove the enormous difference between the body of ratepayers and the gas consumers.

Mr. *Alfred Plant*, examined by Mr. FORBES LANKESTER.

Witness said he was Accountant to the East Ham Urban District Council. The number of public lamps supplied by the Gaslight and Coke Company was 250. The difference in price between 3s. 5d. per 1000 cubic feet, at present charged by the Company, and 2s. 8d., as charged by the South Metropolitan when the Bill was before the House of Commons, was 16s. 1½d. per lamp per annum. The difference now was 1s. per 1000 cubic feet, which made it up to £1 2s. 6d. per lamp per annum. The number of private consumers was 1487. There were 3470 ratepayers in the district supplied by the Gaslight and Coke Company. The rateable value of such area was £71,381. The immediate effect of the Bill would be to take £281 a year from the public authority if the Company charged the full price. When the area is filled in, the £281 will be roughly increased to £1000 per annum.

Cross-examined by Mr. BALFOUR BROWNE: You give the number of



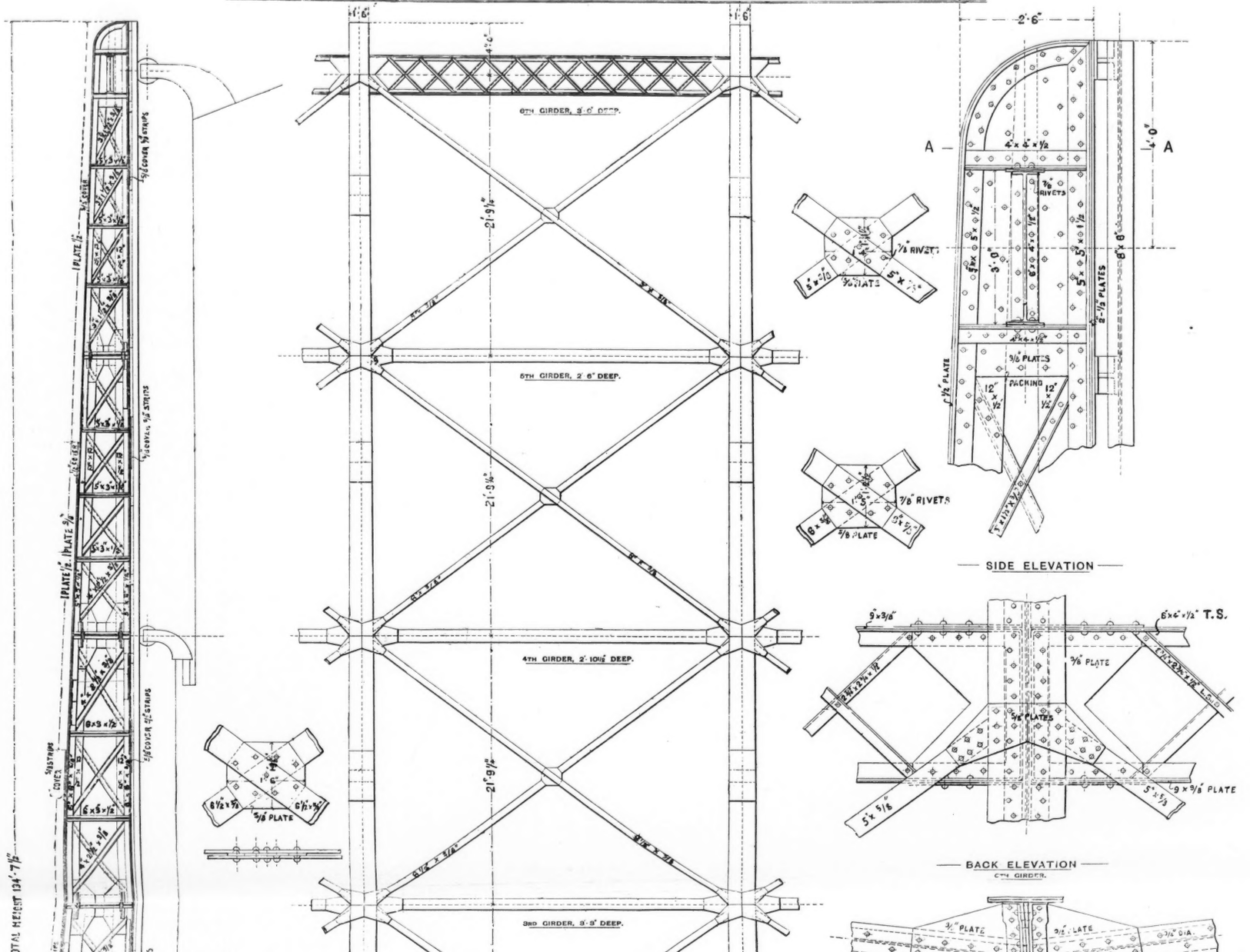
Nº I GASHOLDER

ST. ANTHONY'S WORKS

ELSWICK GAS WORKS.

W. Craig Gibb
Engineer

NEWCASTLE AND GATESHEAD GAS Co


6TH GIRDER, 3'-6" DEEP.
5TH GIRDER, 2'-6" DEEP.
4TH GIRDER, 2'-10⅛" DEEP.
3RD GIRDER, 3'-3" DEEP.
2ND GIRDER, 3'-3" DEEP.
1ST GIRDER, 3'-3" DEEP.
21'-9½"
21'-9¾"
21'-9½"
21'-9½"
21'-9½"
SIDE ELEVATION
BACK ELEVATION
6TH GIRDER.
2'-6"
1'-0"
A
A
3/8" RIVETS
3/8" PLATES
PACKING
2-1½" PLATES
6'x6'x½" T.S.
9"x3/8"
9"x3/8" PLATE
5"x5/8"
3/8" PLATE
5/8" PLATES
8½"x5/8" PLATE
6½"x5/8" PLATE
5"x3/8" PLATE
6"x5/8" PLATE
½" PLATE
3/4" GUSSET
3/4" COVER PLATES
1" PLATE
1½" PLATE
8"x8"x1½"
6"x5"x½"
6"x3½"x⅜"
5"x3½"x⅜"
8"x3"x½"
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public lamps supplied by the Gaslight and Coke Company as 250. What is the total number of public lamps in East Ham?

Witness: In round figures, 1800.

Therefore, upon 1550 you get no such reduction as you get upon the 250?—That is so.

The present total loss to the ratepayers would be £281 per annum?—Yes.

Do you know that the total revenue of the Gaslight and Coke Company cannot be less than £1,000,000?—So I understand.

Therefore this would be about a four-thousandth part of the whole?—I take your word for it.

What is the total number of ratepayers in the whole of your district?—19,093.

And in the part supplied by the Gaslight and Coke Company the number is only 3470?—Yes.

The rateable value figures show the same thing, because the total rateable value is £365,887; while that of the portion supplied by the Gaslight and Coke Company is only £71,381?—Yes.

The latter includes the Royal Albert Dock and many such public works?—Yes.

What do you pay for your lamps to the West Ham Gas Company?—I cannot say offhand.

Mr. FORBES LANKESTER: It is 3s. per 1000 cubic feet; and it is coming down.

The CHAIRMAN: You say the chief consumers of gas are shopkeepers and manufacturers, not the artisans; while the latter would have to pay the rate?

Witness: Yes.

Although they get no advantage from it?—Yes.

Mr. *A. H. Campbell*, examined by Mr. FORBES LANKESTER.

Witness said he was Surveyor to the East Ham Urban District Council. The public street lighting was in his department. In a district like that of East Ham, developing at the rate of 60,000 inhabitants every ten years, there would soon be 750 lamps required; and that would entail a difference in price of £970 a year, if the scheme were carried through.

Cross-examined by Mr. BALFOUR BROWNE: Have you the electric light in East Ham?

Witness: We are just about to switch it on.

And, of course, you will supply your streets?—The main roads.

And then you will be independent of the gas?—No, our main roads are but a tithe of the others.

How many miles of main roads have you in the area supplied by the Gaslight and Coke Company?—About a mile-and-a-half or two miles.

How many miles of streets in the same area?—Not more than 3 miles; but there will be more when the district develops.

Mr. FORBES LANKESTER: That is all the evidence I propose to call.

Mr. T. BEVEN then addressed the Committee on behalf of the Borough of Hackney, which, he said, had a population approaching a quarter-of-a-million, and a rateable value of £1,250,000. He asked the Committee to allow the matter of public lighting to remain *in statu quo* until the Gaslight and Coke Company came before Parliament next session, when the matter could be fully and adequately discussed in the presence of those mainly interested. The proposal to alter the cost of public lighting was altogether apart from the main purpose of the Bill; and the South Metropolitan Gas Company cared nothing about it. The public authorities did not want an alteration in the arrangement made between themselves, the Board of Trade, and the Gaslight and Coke Company; and the latter body did not even come and ask for it. And if they did ask for it, he would submit, with great confidence, it should be refused, because they would be asking it as a premium on inefficiency.

Mr. G. J. TALBOT said, on behalf of the Borough of Marylebone, that he had one witness to call.

Mr. *Garbutt*, examined by Mr. TALBOT.

Witness said he was Town Clerk of the Borough of Marylebone, which took strong objection to the burden proposed to be put upon them. The total quantity of gas used for public lamps for the year ending June, 1901, was 65,494,000 cubic feet, representing, at 2s. 8d., a yearly sum of £8732. If the clause were passed, £2456 would be added to that—making £11,188. The proportion of electric light consumers to gas consumers in the district was very large, as compared with other parts of London. Therefore, by reason of the proposed distribution of increased income among the gas consumers generally, a great injustice would be done to Marylebone.

Cross-examined by Mr. BALFOUR BROWNE: Have you purchased the undertaking of the Metropolitan Electric Supply Company?

Witness: The purchase is not completed, nor the price arrived at.

But the Provisional Order has passed through the House, and you are to become the purchasers?—Yes.

Do you intend to supply electricity to the streets, or will you bind yourself to take the Gaslight and Coke Company's gas for the streets?—I think it is a very open question whether electric lighting will become the light for public streets.

Your neighbour, St. Pancras, has lighted its streets with electricity?—Not advantageously, so far as the ratepayers are concerned.

Mr. BALFOUR BROWNE: No; they cannot get a Gaslight and Coke Company to pay for them.

Mr. TALBOT said the Borough of Marylebone, though petitioning in the House of Commons, had not been represented there by Counsel, as they assumed that the views of public authorities would be sufficiently represented by the London County Council. It was tolerably obvious that the Committee in the other House thought that in the proviso they were meeting the objections of the Local Authorities; but as a fact, it entirely failed to do so. He would not repeat the arguments of his learned friends, but he associated himself with them. He would, however, point out that, if the clause were passed, the consideration which was to be paid to the Gaslight and Coke Company by the South Metropolitan Company would be less than it otherwise would be, as, in addition to that consideration, they would obtain an increased income from the public lighting.

Mr. MEYER, on behalf of the Borough of Fulham, said he could not help thinking that his learned friends, when before the House of Commons, must have misunderstood the proviso, because it actually assumed that the Gaslight and Coke Company would raise the price of gas to the public authorities immediately the transfer was effected. He took his stand on the point of principle that the public authorities were entitled to gas at the present price according to the undertaking entered into by the Company. If the clause were passed, all the Local Authorities north of the Thames would, at one stroke of the pen, be compelled to pay 40 per cent. more than they paid at present for street lighting.

Mr. MORTEN, on behalf of the Borough of West Ham, said he would not add any remarks, but would adopt the arguments placed before the Committee on behalf of the London County Council and East Ham.

This closed the case for the petitioners.

Mr. BALFOUR BROWNE, in replying on the whole Bill, said that it would have been better if the petitioners had left the Gaslight and Coke Company alone, instead of abusing them as they had done. He was not going to defend them; but it would have been better to have left them unassailed, because they would have to answer a great many allegations when they came before Committees in the next session of Parliament. Proceeding, he contended that Sir James Rankin's Committee had had the matter of the difference of price to public lamps caused by the transfer in their minds, and read a passage of the report in support of his contention, and also an extract from Mr. Livesey's evidence before the Committee. Why should the public authorities and the ratepayers of London have their price for gas kept down by keeping up the price to private consumers? No Bill had ever passed their Lordships' House where such a clause was inserted to keep down the price in one area by something happening outside that area. Besides having to supply the consumers on the south side at a loss, the Company were supplying gas to the Local Authorities on the north side at a loss; and the consumers on the north side had to make up that loss.

Mr. FORBES LANKESTER: My learned friend has not called any evidence to show that, if the Company are relieved from supplying the south side, they would not be able to supply gas to Local Authorities on the north side at the present price without making a loss.

Mr. BALFOUR BROWNE said the passage from the report which he had read showed that the Gaslight and Coke Company were losing 2½d. per 1000 cubic feet by the south side supply.

Mr. FORBES LANKESTER said that evidence was before the Committee that gas could be more cheaply produced at Beckton.

Mr. LITTLER said that a question of this sort could not be tried upon a passage in a report, but on evidence.

Mr. BALFOUR BROWNE, proceeding with his argument, contended that there was not one word in the Bill affecting the charges for public lighting. It said that if the Gaslight and Coke Company did increase the price for it—which they could not do without an Act of Parliament—then the extra money was to be applied to the reduction of the price of gas to the private consumer. It did not assume that an increased price would be charged for public lighting, as had been contended. He had heard it said that the Board of Trade were not present to support the Bill. He would point out that the President of the Board of Trade voted in favour of it on the third reading in the House of Commons; and the point had been raised by a Metropolitan Member on behalf of the London County Council. Further, he contended that the clause was workable. As to the auction clause, it had been objected that there was not a sufficient public appealed to; but the Company had 250,000 consumers, and 4000 employees, which was a very substantial public indeed. With regard to the auction clause, the House of Commons had had a full opportunity of rejecting it on the third reading; but they had passed it.

Mr. FORBES LANKESTER: The auction clause was the only point raised in the House.

Mr. BALFOUR BROWNE: My learned friend is wrong again, because Sir Henry Fletcher's special report was before the House.

The Committee then deliberated upon the Bill in private. On the re-admission of the public,

The CHAIRMAN said: My Committee desire me to say they have passed the preamble of the Bill, subject to leaving out from the word "applied" in clause 3 to the end of the clause.

The effect of the decision was to leave clause 3 as follows:—

The Company and the Gaslight and Coke Company may enter into and fulfil agreements for, and in relation to, such purchase and sale and the transfer and vesting of the undertaking in the Company, provided that no such agreement shall have effect unless the Gaslight and Coke Company shall have obtained, in the ensuing session of Parliament, from Parliament, powers to raise additional capital, and provided, further, that the Act authorizing the raising of the additional capital shall define the manner in which the money to be paid by the Company to the Gaslight and Coke Company shall be applied.

The portion struck out of the Bill read:

And shall provide that all moneys which the Gaslight and Coke Company shall receive from any Local Authority for public lighting in excess of that which the said Gaslight and Coke Company would have been required to charge but for the transfer of the said undertaking, shall be applied in a reduction of the price of gas supplied to the private consumer.

On the announcement of the decision,

Lord R. CECIL asked if the Committee would proceed with the consideration of clauses.

The CHAIRMAN: I want to know whether the agreement entered into between these two Companies will be scheduled to the Gaslight and Coke Company's Bill when it comes on next session.

Mr. NEVILLE (for the Gaslight and Coke Company): There is no agreement, and we do not know that there will be an agreement. It depends on the question of price.

Mr. LITTLER: I submit that, if there is an agreement, it ought to be scheduled. Words should be introduced into clause 3 which shall declare that any such agreement shall be submitted to Parliament.

The CHAIRMAN: I think that is what my Committee wish to be done.

Lord R. CECIL: The expression of your Lordship's Committee's views will be upon record now; and no doubt it will carry the greatest possible weight with a future Committee of the House. I do not desire

to put a clause into the Bill on the subject, unless your Lordship thinks it right, because it might fetter another Committee of Parliament; and that is the ground of objection raised by the petitioners against the part of clause 3 which has been struck out.

Mr. LITTLER: It does not tie the hands of Parliament.

Lord R. CECIL: Nor would anything else. You cannot compel them. All that the Committee can do is to express the opinion that some course ought to be taken. To insert it in the Bill would not be a proper course to take.

Mr. LITTLER: It is absolutely in accordance with the usual custom. I will bring up a clause.

At this stage, there was a short adjournment. On resuming,

Lord R. CECIL said the promoters had had an opportunity of considering the point. He understood his learned friend wished to insert after the word "applied," at the end of clause 3 as it now stood, the words: "Any such agreement shall be scheduled to, and confirmed by, such Act."

Mr. FREEMAN: Yes; that is what we ask for.

Lord R. CECIL said he agreed to that, with the exception of the words "and confirmed by," which, if inserted, it would render nugatory the provisions of the present Bill, as it would mean that the South Metropolitan Company would have to obtain a fresh Act to confirm any agreement come to with the Gaslight and Coke Company.

Mr. FREEMAN said the words were necessary. It was no use scheduling the agreement unless the Committee had power to exclude or modify such provisions in it (if any) which might be prejudicial to the public interests.

Lord R. CECIL again pointed out that, if the words were inserted, their Lordships would in effect take away what they had already given the promoters under clauses 2 and 3 of the Bill.

After a short deliberation in private,

The CHAIRMAN announced that the Committee had decided to insert the words "any such agreement shall be scheduled to, and confirmed by, such Act" at the end of clause 3.

The remaining clauses were adjusted; and the Bill, as amended, was ordered to be reported to the House.

HOUSE OF LORDS COMMITTEE.

Thursday, July 11.

(*Before Lord* HATHERTON, *Chairman, Lord* CROFTON, *Earl* CRAVEN, *Lord* ARDILAUN, *and Lord* ST. OSWALD.)

MOND GAS BILL.

Consideration was to-day commenced by the above-named Committee of the Bill to incorporate and confer powers on the South Staffordshire Mond Gas Power and Heating Company. The Bill has already been passed by a Committee of the House of Commons, the proceedings before whom were reported in the "JOURNAL" during April and May

Mr. BALFOUR BROWNE, K.C., Mr. CLAUDE BAGGALLAY, K.C., Mr. ROGER WALLACE, and Mr. GERALD FITZGERALD, K.C., appeared for the promoters; Mr. WEDDERBURN, K.C., and Mr. W. L. WILLIAMS represented the Walsall Corporation, who were, at this stage, the only petitioners against the Bill.

Mr. BALFOUR BROWNE, in opening, said the object of the Bill was to give the public the benefit of a very cheap gas for heating and power purposes. The only reason for coming to Parliament was that, in order to supply, the Company must have power to break up streets and roads in the district for laying their pipes. The gas could be used directly or indirectly for motive power, in all cases where steam was now employed, and in all heating operations; and it was especially valuable where the flame had to be brought into direct contact with the matters to be heated. Up to the present time, the gas-engine had not had a fair chance; and the evidence would show that, with cheap gas, the gas-engine would beat the steam-engine out of the field altogether. In this district, the cost of gas was something like 2s. per 1000 cubic feet; but for the purposes of manufacture, this price was out of the question. Mond gas could be produced and sold to consumers at 2d. per 1000 cubic feet; but its calorific power was not nearly so great. In order to get the same effect with Mond gas as with ordinary gas, the manufacturer would probably have to burn four times the quantity; so that the price would be 8d., against 2s. He believed he could prove that the same power could be obtained from 10 million tons of coal by means of Mond gas as the country obtained from 50 million tons in the ordinary steam-boiler; and if this was so, the national saving would be enormous, and a tremendous boon would be conferred on manufacturers. A large number of firms had already taken up this method of producing power and heat; but the difficulty was that if a manufacturer did adopt it, it was entirely separate from the business which he was carrying on. The present Company would act only as the producers of power and heat; and therefore the business would be carried on better and cheaper than by the manufacturers engaged in other industries. There were a large number of manufacturers in the district who were anxious to use the gas, and who would be the customers of the Company. Since the Bill was before the House of Commons, the districts of Handsworth and Perry Barr had been left out of the measure; the reason being that they were residential suburbs of Birmingham, and contained no factories. The Company now covered the districts of 27 Local Authorities; but only one was at this stage opposing—viz., the Corporation of Walsall, who said the Company should not be allowed to enter their district. The matter of the supply of power in relation to local authorities was threshed out before Lord Cross's Joint Committee, who reported that, where sufficient public advantage was shown, powers might be given for the supply of electrical energy over an area including the districts of numerous local authorities; and, further, that a local authority should be entitled to be heard before the Board of Trade, but should not, so to speak, have a provisional veto only to be dispensed with in certain cases by the Board of Trade. Sir James Kitson's Committee on the Durham Electric Power Bill found that the value of electrical energy for transmitting and applying power had been amply demonstrated, and its importance to the industries of the country admitted. They accordingly advised that it was a public advantage to facilitate measures which might ensure a general supply of electrical power to all consumers who might seek to avail themselves of the economy and efficiency offered in the service of such power. If this was true with regard to electricity, it was far more true of Mond gas. What Walsall wanted was the veto to which the Joint Committee had referred. Were the local authority of a district to have the right to deprive the manufacturers in their area of Mond gas? That was what they wanted to do. In their petition, the Corporation submitted that the competition with them in the supply of gas for heating and power purposes, proposed to be sanctioned by the Bill, would be unfair to them and to the ratepayers of their borough, whose money had been expended, and whose credit had been pledged, for the purposes of their undertaking. They said further that the grant of authority to a company to compete with an established statutory undertaking, particularly where such an undertaking was vested in the local authority, would be contrary to the principles hitherto acted upon by Parliament, and to the interests of the public. If this were true, said Counsel, they would very likely succeed; but it was not true. The Company were not going to compete with them really; and even if they were, it would merely be in the interests of the public. The Corporation were going beyond municipal functions altogether in supplying gas for heat and power; and he therefore asked the Committee to refuse the prayer of the petition.

Sir *Frederick Bramwell*, examined by Mr. WALLACE, said there was not much room for improvement in the steam-engine. The manufacture of Mond gas enabled them to get practically three times the value out of the fuel in power that was obtained when the fuel was used in the steam-engine, and it also enabled them to get a very large amount of sulphate in the process. He believed Mond gas would be of great benefit to any town or district which desired to wake up; and therefore it would be of benefit to Walsall. If Walsall was not included, one of the centres for the use of gas would be taken away; and a re-adjustment of the generating stations would be necessary. The complaint of Walsall, that insufficient storage was provided, showed that they did not understand the process, because no storage was necessary. He did not consider that Mond gas competed with ordinary gas. The figures of the Walsall gas undertaking showed that they had been doing a profitable business. He made out that in six years they had spent roundly £40,000 of capital. If Walsall refrained from continuing this rate of expenditure, the works as now existing would be needed for the ordinary growth of the consumption of gas for illuminating purposes, even though the supply for power were taken away from them. No plant would be rendered idle by the introduction of Mond gas. Mond gas would cause an extension of the industries of the district; and therefore more gas for illuminating purposes would be required. With regard to the labour required by the Mond plant, witness said he could conceive no more economical gas producing plant.

Cross-examined by Mr. WEDDERBURN; Do you know that the only suggestion of support from Walsall in the other House was that there was a petition put in signed by 23 Walsall people, not one of whom was called, and all of whom had signed upon the statement that Walsall was going to be supplied in bulk at their boundary?

Witness: I do not know.

Mr. FITZGERALD: It is not the case that these gentlemen signed on such a representation.

Mr. WEDDERBURN: I am told it is so. When they are called, we will see.

Further cross-examined: With the exception that the position of the generating stations would probably have to be revised, it would be possible to cut out the Walsall area from the district of supply, in the same way that Handsworth and Perry Barr had been cut out.

Mr. WEDDERBURN: This producer gas is by no means a new thing?

Witness: That is so.

And there are various kinds of producer gas?—I believe there are. I know of two; but I have heard mention made of yet another. The two I know of are Siemens and Dowson.

Take Dowson gas. Do you suggest that Mond gas is cheaper than that?—For purposes of distribution, I believe it is.

Is it cheaper in production?—Yes. I am not aware that Dowson's process recovers any ammonia.

But the recovery of the ammonia is of no advantage to the consumer, except in the matter of price?—I do not know what other advantage the consumer could expect.

The price of Mond gas is to be 2d. per 1000 cubic feet?—Yes.

Suppose it were shown that the price of Dowson gas works out at ¾d. per 1000 cubic feet, that would be a great thing in favour of it, would it not?—It all depends on the amount of capital spent to produce it, and the charge necessary to keep up the supply. Mond gas is delivered to the consumer free of all charges of that kind.

Do you know that a small consumer can get a small Dowson plant for a capital expenditure of £150?—I do not know that; but I take it from you.

In Walsall, would not such a plant be infinitely more suitable to the people who want it than Mond gas can ever be?—I certainly have no knowledge of that; and until you can give me reason to believe it, I should think that it is not true. I cannot conceive of any power more useful for any trade than that which you can have by merely turning on a tap.

That usefulness you have with Dowson gas?—But you have to produce it.

Who will use Mond gas?—The large manufacturers mostly—people taking 10 million cubic feet a year.

Do you know that by the Bill the Company are not to be allowed to supply small consumers?—They are not to supply below one million cubic feet at 2d. per 1000 cubic feet, I believe. That would come to £8 6s. 8d.—not very much.

In the case of ordinary gas, a small consumer can compel the Company to give him a supply can he not?—Yes; but that would be a mistake here. It would prevent the large consumers being supplied at a low rate.

If, then, I can show that Walsall consumers are small ones, I shall have proved that Mond gas is of no use in Walsall?—Yes; except that

think this new source of supply of a cheap commodity will create a fresh demand in the rise of manufacturing industries.

The patents for the Mond gas expire in 1908. Which would be the best course—to wait eight years to have a supply, and then if they want it to be able to make it themselves, and get it free from patent charges; or to have the chance of obtaining it within the period of eight years by contributing to the large profits going into the pocket of Dr. Mond?—They would not contribute to Dr. Mond's profits unless it was beneficial to them to use it; therefore they had better have the chance of obtaining it at once.

Can you point to a case where Parliament has enabled a patent to be prolonged by giving power to peg out a claim to supply?—I cannot see how Parliament enables the patent to be prolonged.

Is the retention of Walsall necessary to the passage of the Bill?—No.

Re-examined by Mr. WALLACE, witness said that Parliament sanctioned undertakings, which were kept alive by the use of commodities the manufacture of which was carried on under patents.

The CHAIRMAN asked whether the alterations in clause 35 as to the price of slack were made before or after the opposition of the other petitioners was withdrawn.

Mr. WEDDERBURN: I do not know. We did not receive them until two days ago.

The PARLIAMENTARY AGENT for the Bill said the alterations had been made at the instance of the Board of Trade, and were in the filled-up Bill.

The CHAIRMAN: They have been inserted since the Bill left the other House?

Mr. WALLACE: Yes; but the changes do not make any practical alteration in the sense of the clause.

Lord *Kelvin*, examined by Mr. BAGGALLAY, said he was of opinion that the Mond scheme was perfectly practicable. Mond gas at the price of 2d. per 1000 cubic feet used in gas-engines would be cheaper than the present mode of generating power.

Cross-examined by Mr. WEDDERBURN, witness said that if the gas were sold for a higher price than 2d. per 1000 cubic feet, it would affect his evidence in its favour. He had no doubt, however, that at 3d. per 1000 cubic feet the gas would be more economical than coal.

Mr. WEDDERBURN: What is there in the Bill, except the statement that "it shall not" be used for lighting, to prevent the Mond gas being employed for that purpose, if a fitting mantle is invented?

Witness: I think the people of Walsall should not be prevented from getting gas cheaper than they do at present, if it is available.

Then your view is that, if there should ever be an invention by which Mond gas can be used for lighting, it ought to be so used?—I think it would be wrong to extend the privilege of the gas companies so far as to prevent the adoption of a cheap lighting material.

Mr. WEDDERBURN: We may, I suppose, look on this as the thin end of the wedge, and expect that this gas may come into competition with ours for lighting.

Mr. BAGGALLAY: Not if you look at section 5.

Mr. WEDDERBURN: That is illusory.

Mr. BAGGALLAY: Then you had better reserve the matter for your speech. The section says that the gas "shall not be employed or used for the purpose of illumination."

Mr. WEDDERBURN: That is what the section pretends to do. I will, however, reserve the point.

Re-examined, witness said he did not know of the obligation in section 5 until now. But if a man took a gas as fuel, or raw material like oil or coal, and could find a mantle which would enable him to burn it for illuminating purposes, he should be allowed to so use it.

The CHAIRMAN: Will it be possible to use this gas for cooking purposes?

Witness: Yes, and for heating.

Mr. *Shannon*, clothing manufacturer, of Walsall, said he had been in the habit of using Dowson producer gas to a large extent; but he considered that Mond gas possessed many qualities which would lead him to prefer it, if he could get it. Dowson gas clogged up the pipes; but he understood Mond gas did not. Moreover, there was a want of uniformity in Dowson gas, which did not exist in Mond gas. His firm had a gas-engine; but they used it as little as possible among their 2000 workpeople, owing to the high price of Corporation gas. Mond gas would be of great advantage to Walsall manufacturers, large and small. Those running a 6-horse power engine now would be able to run one of 12 or 14 horse power. The difference in expenditure would enable them to get electric light instead of using bad gas. It would be possible to manufacture electricity much cheaper than at present.

Mr. WEDDERBURN (in cross-examination): Are you ready to give an undertaking now to take Mond gas at 2d. per 1000 cubic feet.

Witness: Perfectly willing.

Are you ready to give an undertaking to take it at 4d.?—I cannot say. We are ready to take it for all our power, instead of steam.

Mr. WALLACE (in re-examination): Has anyone proposed to you that you should take Mond gas at the price of 4d. per 1000 cubic feet?

Witness: Certainly not.

Professor *Dewar*, examined by Dr. WALLACE, said he agreed with the evidence given by Sir F. Bramwell and Lord Kelvin. Of all producer gases, Dr. Mond's seemed to be the survival of the fittest. It involved the economical use of inferior coal, and in the best way for the recovery of sulphate of ammonia.

Mr. WEDDERBURN (in cross-examination): If it is clear that this is a survival of the fittest, why should the Company seek to supply not only their own Mond gas, but every other kind of producer gas as well?

Witness: I think that means modifications.

They seek to supply the producer gas commonly known as Mond gas, any development of Mond gas approved by the Board of Trade, and any other producer gas?—If they have got in all the pipes, why should they not be allowed, subject to the Board of Trade, to produce something which again would be better. Mond gas is the fittest for the present; but no one suggests it is the fittest there will ever be.

If that is so, is there any reason why it should be limited to large manufacturers?—Well, the large manufacturers at the present time are those who will have it.

In the course of conversation,

Mr. WALLACE said, to remove this ground of opposition, the Company would make a special exception in the case of Walsall, and agree to supply the small consumers.

Mr. WEDDERBURN said the offer was worth nothing.

Mr. *Claughton*, examined by Mr. BAGGALLAY, said he was principal Agent to Lord Dudley in the Black Country, and an original member and a Director of the Mond Company. He had taken a good deal of interest in the last few years in the iron and steel industries of the Continent and America. He thought the introduction of Mond gas as a fuel or as a power into the district would be of great advantage.

Professor *Threlfall*, examined by Mr. BAGGALLAY, said he had studied the question of producing power at the lowest possible rate; and this had led him to pay special attention to the use of gas-engines and the production of producer gas. He came to the conclusion that the gas-engine could be got to work as regularly as a steam-engine, and that it gave very much more economical results. He had gone into the question of gas-engines being operated by Mond gas, and was more than satisfied by the regularity and work produced. The use of Mond gas was the only way we could get power in England anything like as cheaply as it was obtained in America by means of water.

Mr. BAGGALLAY: Do you believe that the supply of gaseous fuel would be an advantage to this district?

Witness: I do not think that puts it strongly enough. I do not think in many ways the district can get on without this system or its equivalent. We are beginning now to feel the scarcity of coal.

Taking the district to be supplied, is it as a whole suitable for the development of this gas, and testing a trial of it?—Very, because it is a district which more than any other depends on having cheap fuel.

Re-examined: He was satisfied the slack of the district was suitable for making Mond gas. The system was now almost automatic.

Mr. *F. W. Cross*, examined by Mr. BAGGALLAY, said he was senior member of Messrs. Cross and Cross, constructional engineers, of Walsall. His firm used a gas engine of 30 indicated horse power.

Mr. BAGGALLAY: What is your view with regard to applying Mond gas in your own works. Do you think that it would be economical and advantageous?

Witness: I should certainly say it would. There is, as a rule, very considerable loss of heat in the present system of using raw fuel. We do not employ very much raw fuel. We use gas-engines. I think by employing a regenerative system, very great heat could be developed by Mond gas.

If Mond gas were available at your works, would you be prepared to go to the necessary expense of trying it?—Certainly. My firm signed the petition in favour of the Bill.

You want to be able to get the gas direct from the persons who manufacture it?—Yes. I naturally desire to buy as cheaply as I can.

Then you do not want the Walsall Corporation to be supplied in bulk by the Company, and then that you should take it from them as middlemen?—No; I think we should be safe as manufacturers in the hands of the Company.

You would rather take from them?—Yes.

All you want is that they should supply you at whatever is the cheapest price they are supplying anywhere under similar circumstances?—Yes.

You know the Bill provides that the gas must be supplied to all persons under similar circumstances on equal terms?—I think that is so.

Do you think the introduction of Mond gas would prove advantageous to the district generally, and particularly to Walsall?—I do.

Cross-examined by Mr. WEDDERBURN: His works were erected last year. The nominal horse power of the engine was 12, and the indicated horse power 30. The engine was bought last year. Walsall had many trades; the principal being saddlery. He had endeavoured to obtain support for the Bill in Walsall. He hoped to get Mond gas at 2d. per 1000 cubic feet. He might have told the people in Walsall whose support was obtained to the petition, that they also would probably get the gas at that price. There was no obligation on the Company to supply anyone desiring less than 4 million cubic feet per annum.

Re-examined: When the petition was presented in the other House, he had never asked anyone to support it. It was only after the Bill left the House of Commons, and the promoters knew that Walsall was going to continue its hostility, that he was asked to see what support he could obtain. People there were afraid Walsall might be excluded from the Bill.

Friday, July 12.

Mr. *Herbert Humphrey*, examined by Dr. WALLACE, said he had been for ten years Chief Engineer at the chemical works of Messrs. Brunner, Mond, and Co., at Winnington, Cheshire. Since 1894 up to the present time, he had carried out experiments connected with the production and use of Mond gas for power purposes. He had had experience of the distribution of the gas at Winnington, where there was large plant. The gas was distributed throughout the works (which covered a very extensive area), not only for power purposes, but for application to furnace work and for various other uses requiring heat. The Mond gas plant at Winnington was very large; there being twelve producers, each capable of gasifying 20 tons of fuel daily. About 200 tons of fuel daily, or some 73,000 tons per annum, were gasified there; the production being over 1 million cubic feet per hour, day and night. In the five stations collectively in South Staffordshire, the Company expected to gasify about 185,000 tons of coal per annum; so that the distribution scheme would be only about two-and-a-half times as large as the one at Winnington. The present scheme was not an experiment. At Detroit, in America, there was a very large Mond plant working with equal regularity and success as that at Winnington. The distribution of Mond gas was not a new thing. At Winnington, gas was made at the central station and sent to all parts of the works, and also to an electric station at Northwich, about three-quarters of a mile away.

Mr. WALLACE: Will you point out why Mond gas should be especially useful for distribution in South Staffordshire?

Witness: The system is essentially applicable there because South Staffordshire has a long historical connection with the iron trade of the world; and it is a district which is declining for two reasons. One is

that the thick coal which existed there has been mostly worked out; what is left being an inferior quality of coal which can be successfully used for the production of gas in the Mond plant. We have therefore available a fuel which is very valuable. Then Mond gas will certainly stimulate the iron trade, which has suffered severely in recent years owing to the competition of steel. In bringing a system of this sort into the Black Country, we hope to be of very great use to the trade already existing there, and to induce further trade to come.

It has been suggested that this gas is a commodity which could compete with lighting gas?—I do not see any possible chance of its competing with ordinary gas for illuminating purposes, because it is a non-illuminating gas, and I do not think it can be adapted to illuminating. At Winnington we have over 5000 burners to light the works; but we have an ordinary gas plant for them.

Do you consider the introduction of Mond gas would be beneficial to Walsall?—Undoubtedly. I know something about the manufacturers there, and am sure it would be a great benefit. One of the generating stations we propose to put at Darlaston, just outside Walsall, to suit the convenience of that place.

Mr. WEDDERBURN (in cross-examination): Although, as a matter of fact, it is stated in the Bill that Mond gas is not to be used for lighting, and if used for lighting the Company may discontinue the supply, there is no penalty put upon any person who, having obtained the gas for power, succeeds in using it for lighting?

Witness: No; except that his supply will be cut off.

Why, if you base your calculations on 150 B.T.U., have you limited it in the Bill to 125?—That is the minimum. We fully maintain the position that the value of the gas is 150 B.T.U.; but we have been asked to put a minimum in the Bill, and we have done so. I agree that, as a general principle, what has been stated to the manufacturers of the district should be contained in the Bill.

So if you had gone to the manufacturers of Walsall and said you would supply at 2d., the fair thing would be to put that in the Bill?—We have made no statement that we will supply at 2d. We have told them that is the figure at which we propose to supply. The estimates have been very carefully gone into; and as soon as we get the stations in full working order, we quite expect to be able to supply, not only at 2d., but at an average of 1½d. per 1000 cubic feet. There are about 73 gas-engines in Walsall which might take a supply under the Bill.

Do you mean to say you know of 73 gas-engines in Walsall which would take a supply of 4 million cubic feet?—No; 1 million feet.

Only those who can take 4 millions can claim a supply?—Yes. I have not calculated how many can claim a supply. There are certainly some.

Suppose the Corporation of Walsall, in the last resort, desired to take Mond gas from you in bulk at 2d. per 1000 cubic feet, less the cost of distribution, would you object to give Walsall such a supply?—Yes; I think we can serve the customers a great deal better than the Corporation. No agreement has been made with local authorities to supply them in bulk. My reason for objecting to give a supply in bulk is that the manufacturers do not think the introduction of a middleman, as the Corporation would be, would be beneficial to the trade.

Supposing you were to supply it to the Corporation at a price which would enable them to distribute at the promised 2d., what would your objection be?—Personally, I should have no great objection.

Mr. TAHOURDIN, Parliamentary Agent for the Bilston, Wolverhampton, Willenhall, and Dudley Gas Companies, stated that, though not represented by Counsel, he should appear on the clauses; and he therefore asked, and was granted, permission to question the witness.

Mr. TAHOURDIN: You agree with Sir F. Bramwell that your supply is principally for the large consumers?

Witness: I think that is a matter which has not been made clear. Everything below 6-horse power is excluded; but everything above that is for power, and is included in the possibility of supply by the Company. So that practically we touch all the manufacturers of importance, both large and small.

Would you have any objection to seeing the minimum of 1 million cubic feet increased to 2 millions?—From the Company's point of view, I should not have much objection; but I know the feeling is opposed to that among the manufacturers in the district.

Mr. *H. E. Jones*, examined by Mr. WALLACE, said he did not think it would be a desirable thing for a company to deliver Mond gas or producer gas in bulk to a gas concern, whether owned by a corporation or by a company. It was an entirely different sort of gas from what gas companies were acquainted with at the present time. No gas undertaking furnishing illuminating gas of the sort generally supplied could deal profitably with Mond gas, if they obtained it in bulk, because they would have to lay separate pipes. It would not mix with coal gas.

Mr. WALLACE: Would you not have to get a separate Act of Parliament?

Witness: Yes; and then the undertakers would have to be relieved of their present obligation to supply all customers, everywhere, because this scheme is not feasible, at these low prices, unless you can concentrate a large consumption of gas upon a short mileage of main. For heating and power purposes, something like 300 times as much gas on the Mond system is proposed to be supplied on a mile of main as is usual with ordinary illuminating gas.

If it were supplied in bulk, it would involve other arrangements which would be prejudicial to the consumers?—They would have to imitate Dr. Mond's scheme; and if they did so, they could not get in any one area sufficient consumption of this sort of gas to make it worth while to put down the distributing system. It is only by aggregating these areas (in which there are some twenty different supplies of gas for illuminating purposes) that Dr. Mond can get sufficient to accomplish his purpose.

Cross-examined by Mr. WEDDERBURN: It was only because Dr. Mond anticipated a sale of about 300 million cubic feet per mile of main (whereas in Walsall, the consumption per mile was 6 millions, of which only 1 or 1½ millions were for heating), that his scheme was expected to become profitable. He did not see how it would hurt the Company or the people if the Walsall Corporation were to lay down similar pipes to those which Dr. Mond would lay, and bought gas in bulk from the Company at the edge of the district; but he did not know what advantage was to be derived. It might damage the scheme by rendering it, at the outset at least, less profitable than it would be if the Company supplied in Walsall.

Mr. WEDDERBURN: But we have understood that unless they get sufficient customers they will not come into Walsall. Assuming it to be worth their while to come, what difference does it make, either to the Company or consumer, if, the gas being used at the same price, the control of its distribution is in the hands of the Corporation?

Witness: Assuming that it is the same quantity, the same sized pipes, and the same consumers, I do not think it matters whether you have A. or B. at the point where it enters—*qua* that particular position of the area. I have not studied how far it enters into the main scheme of distribution.

You suggested that the Corporation would have to get an Act of Parliament. The Corporation could break up the streets and lay pipes without an Act, could they not?—I think not.

They have the power to break up the streets to supply gas. If there were a desire in Walsall for Mond gas, do you suppose there would be anyone to oppose the Bill?—If I were a ratepayer, I would oppose your starting a scheme in one area when there is another comprehending the whole district.

It would all be a question of price, would it not?—Yes.

There is no provision for storage, is there?—No; and I am of opinion that there is no necessity for it.

Mr. Woodall, in the other House, expressed the opinion that storage is necessary?—Yes; he disputed the fact, but there are companies supplying illuminating gas who have no storage.

He went further than disputing a fact, for he disputed an opinion of yours. At what distance from the works is illuminating gas often supplied?—Fifteen to twenty miles.

Mr. WALLACE: The only other witnesses we propose to call are people from the district who desire to have the supply.

Mr. *Frederick Brown*, an electrical engineer, examined by Dr. WALLACE, said his firm thought the introduction of Mond gas into the district would be to their advantage. They at present had a gas-engine of 23 brake horse-power, for which they used Corporation gas. But it was very high in price. They were anxious if possible to get cheap producer gas.

Mr. WALLACE: It has been suggested that the Corporation should be prepared to take the gas in bulk from the promoters, and that then they (the Corporation) should supply it to you. Are you anxious to have a middleman, as it were, between you and the Company?

Witness: I do not see the desirability of it.

It is obvious that if they had their own gas, manufactured at their existing works, the Corporation would not find it to their interest to buy a gas which would undersell their own. So that, if the Corporation had it in their power to buy in bulk, it would not be to their interest to do it—it would pay them better to leave you to take their present authorized supply?—That is the way I should look at it.

Mr. WEDDERBURN (in cross-examination): You did not sign the petition?

Witness: No; neither was I called as a witness in the other House.

When were you approached with a view of supporting the Bill?—Last Saturday night.

What price are you expecting to get this gas at?—I am hoping to get it at 2d. per 1000 cubic feet. But even at 4d. it would be much cheaper than the Corporation gas.

Do you think it should be obligatory on the part of the Company to supply everyone at the same price? Why should they refuse altogether to supply the small people—charging 4d. to those taking the minimum supply, and 3d. to those taking a large supply?—It is as fair as it would be for me to charge less to the purchaser of a large quantity of the commodity I sell than to the purchaser of a small quantity. The best motive power in Walsall, seeing that the trades are light ones, is electricity. We are using that, but should employ Mond gas if we could get it.

Mr. *Sydney Wheway*, a manufacturer of chains at Walsall, said he employed between 200 and 300 workpeople. They had one gas-engine, which was worked by Corporation gas. If there was a chance of getting Mond gas at 2d. per 1000 cubic feet, it would be a great advantage, and he should not hesitate to take it. No doubt the price would depend to some extent upon the contingency of the price of coal. At present he was paying too much for his gas for motive power.

Mr. WEDDERBURN (in cross-examination): Would you say that there ought to be a clause in the Bill by which all people in Walsall should be supplied with gas at 2d. per 1000 cubic feet—subject to a rise in the price of slack—and that if the Company did not come to Walsall within a given period, their powers with regard to the supply of the town should lapse?

Witness: I would not go as far as that. I would not say all consumers should be supplied at 2d. If they supply small consumers, it would only be fair to charge them more.

Mr. *J. Moseley*, hardware manufacturer, said his firm had considered the proposal, and that the promoters should have the power to sell Mond gas in the district. They had based their calculation on 2d. per 1000 cubic feet. His firm had 200 workmen. They employed two steam-engines; the price of the Corporation gas being too high for gas-engines. If they could get Mond gas at 2d. per 1000 cubic feet, they would use it; and on this matter they did not approve of the attitude taken up by the Walsall Corporation.

Mr. *A. W. Greatrex*, J.P. tanner and currier of Walsall, gave similar evidence. He expressed strong disapproval of the attitude of the Walsall Corporation; declaring that he should be sorry to see Walsall left out of the Bill.

Cross-examined: He thought the Corporation were right in opposing, to see that there was no increase made in the price.

Mr. WALLACE: I have nine or ten similar witnesses from Walsall.

Mr. WEDDERBURN: Mr. Balfour Browne yesterday gave me the names of five gentlemen he proposed to call; but we have not seen them.

Mr. WALLACE said they had all the witnesses but one, who had gone home. He did not propose to call more evidence of this kind.

Mr. WEDDERBURN said he should not contest the point that there were a large number of people in Walsall who desired to have the

chance of buying this gas on certain terms. The promoters had promised terms; and he wished them to be bound to those terms.

The CHAIRMAN said the Committee did not require to hear more witnesses.

Mr. WEDDERBURN said the case might be greatly shortened. He would ask them to exclude Walsall rural district, about which there would be no argument after what had been said by Sir F. Bramwell, who stated that he did not see why the Walsall district should not be omitted from the area. He should be content to withdraw his opposition if his learned friend would concede the following terms—namely, that the promoting Company should come and lay their mains in Walsall within three miles of the boundary within three years; and that they should supply their gas to all consumers at 2d. per 1000 cubic feet, subject to a revision of price if the price of slack went up. If he got this, he should have obtained for Walsall all that he thought it right to ask for. Of course, if the Company did not come to Walsall in three years, all their powers should lapse. All the evidence from Walsall went to the points which he had put before the Committee. All the witnesses told the Committee that they only supported the Bill on the principle that the price of the gas was to be 2d. per 1000 cubic feet. It would be a breach of faith with the people of Walsall to make a higher charge than 2d.

The CHAIRMAN: You will require time to negotiate and consider this matter. We will take an adjournment for half-an-hour.

The Committee were dispersing when,

Mr. BALFOUR BROWNE (who had come hurriedly into the room) said he did not think there was the least chance of coming to terms. To adopt the proposal now made would be unfair to the rest of the district. The promoters had not given any such terms as those asked for to the other Local Authorities; and he wanted to be fair to them. He did not wish to put Walsall in a bit better position than any other place.

Mr. WEDDERBURN said his case was this: In what sense did the people of Walsall desire that the Company should come within their boundary? The people of Walsall said the Company should only be admitted on certain conditions. They contended that, unless the conditions were complied with, Walsall should go out of the Bill.

Mr. BALFOUR BROWNE said that was not the evidence. What the Company would do for Walsall was what they would do for any other local body in the proposed district of supply. The Committee, he thought, would consider it wrong to give Walsall better terms than they had given other people.

Mr. WEDDERBURN remarked that Mr. Balfour Browne, in his opening statement, said the Corporation of Walsall were standing between the Company and the people who desired to take the gas. The evidence was that the people wanted the gas only on certain conditions—that was to say, on condition that the charge was 2d. per 1000 cubic feet, that the Company undertook to supply everybody, and that the supply to Walsall was available within a given time.

Mr. BALFOUR BROWNE intimated that that was the close of the case for the promoters. He asked Mr. Wedderburn if he proposed to call evidence.

Mr. WEDDERBURN, in reply, said that he would now address the Committee for his clients without calling evidence; their case having been made sufficiently clear from the cross-examination of the witnesses for the promoters. He submitted that there was no ground for meting out a different measure of justice to the Walsall rural district to that meted out to Perry Barr and Handsworth. These places had been excluded; and as there was no difference between the ordinary country characteristics of these places and those of the Walsall district, the area should also be excluded. The country was open—it was not a manufacturing country at all. The question was what did Walsall want, and did the Corporation rightly oppose the Bill? He answered this query in the affirmative; submitting that the Corporation were only acting as faithful guardians of the interests of the people of the town. The legislation proposed in the Bill was unprecedented. In some six years the principal Mond patents would have run out; and therefore in a short time the people of Walsall would be able to supply themselves with this gas without contributing to the promotion money involved in the formation of the Company. The Company took power to go to Walsall; but they might not exercise it. Obligation should therefore be put on them to say whether or not they meant to go there. The clause in the Bill relating to this matter would be satisfied if the Company put themselves in a position to supply part of the district; it did not compel them to go into every local area. A clause should be inserted that, if they did not go to Walsall within a certain time, their powers in regard to it should lapse. It would not be fair that they should continue to have the right to enter the town by reason of the fact that they were supplying elsewhere, and that they should retain that right even after the patents had lapsed. If Walsall was of value to the Company, let them come to Walsall, and be bound to come. An all-important point was, What was the desire of the Walsall people? There were practically only two alternatives with regard to the Corporation of Walsall. One was to leave it out altogether, and the other was to put it in upon the conditions on which the support of the Walsall people was obtained. If promoters went to a district and made certain statements, and obtained support upon the faith of those statements, they should be held to their promise. Had anyone any doubt as to the view of the people of Walsall, and the condition on which their support was obtained? The evidence showed clearly that it was on the faith of statements that the gas would be supplied at 2d. per 1000 cubic feet; that there would be an obligation to supply; that the power should lapse if the supply was not given; that there should be a supply to everyone (though perhaps the smaller consumer should be supplied at an increased price); and that there should be a rise in price if the cost of slack went up. The witnesses from Walsall had calculated that, the price being fixed at 2d. per 1000 cubic feet, whether they used 4 million cubic feet or not would not matter, because they could guarantee to take 4 millions, seeing that it would only amount to £32 per annum, at which price it would pay them. It was upon the faith of that that they had supported the Bill. Now, however, the Company would not agree to anything of the kind. The Company asked the Committee not only to fix the price in the case of small consumers, as a maximum, at 3d. or 4d., but to reduce the number of British thermal units from 150 to 125; so that the result would be that, while support had been obtained to the Bill on the faith of the statement that the cost of the gas as the equivalent of coal gas would work out, by multiplying 2d. by four, to 8d., the truth might be that it might be 4d. or 3d. multiplied by five, which would be 20d. or 15d. Either the Corporation of Walsall, in common with the Walsall rural district, should be excluded from the Bill, or, if left in, it should only be upon the terms which it had been shown in evidence were the sole conditions which won the support of the manufacturers. The people of Walsall desired to be out of the Bill, or, if left in, that the terms should be that the Company undertook to lay mains within 3 miles from the boundary; that they supplied all customers (large and small) at the promised price of 2d. per 1000 cubic feet, subject to a provision for an increase in price if the cost of slack rose; and then, if the Company did not do that, that at the end of three years the powers of the Bill should lapse.

The room was then cleared while the Committee deliberated in private. On the re-admission of the parties,

The CHAIRMAN said: The Committee are prepared to find the preamble of the Bill proved, subject to the Company being compelled to be in a position to supply Walsall by a given time, and some protection being given to the small consumers, which the Committee suggest might be given by altering section 34 to: "Provided further that the Company shall not be compelled to supply any person with a less quantity of gas than 1 million cubic feet in a year," instead of: "Provided further that the Company shall not supply any person with a less quantity of gas than 1 million cubic feet in a year."

Mr. BALFOUR BROWNE: I shall have no objection to that. You said "a given time." What time will you think fair? It will take a little while to build the station.

The CHAIRMAN: What was in the mind of the Committee was three years.

Mr. WEDDERBURN asked that within a limited time the Company should come to Walsall; and that if they do not do so, their powers should lapse.

The CHAIRMAN (after further discussion): The Committee understand it is to be four years from the 1st of January next; and if the works are not completed and gas delivered by that time, the powers with regard to Walsall lapse.

Mr. TAHOURDIN said the provision which the Committee proposed to alter as to the Company not supplying any person with a less quantity than 1 million cubic feet, was put in at the instance of the Gas Companies, and upon their opposition. Those Companies had had no opportunity of being heard before the present Committee, because of the insertion of the proviso. The insertion of the words suggested by the Chairman would have the effect of enabling the Company to supply all those whom, it had been contended for the Gas Companies, the promoters should not supply with less than 1 million cubic feet. He must ask the Committee to re-consider the matter.

Mr. BALFOUR BROWNE: I understand your Lordships desired to give the benefit of Mond gas to the smaller manufacturers.

Mr. WEDDERBURN: The objection raised now can be met by limiting the alteration of the proviso.

The CHAIRMAN: The Committee fail to see why the smaller manufacturers should not have the advantage of this cheap means of producing power.

Mr. TAHOURDIN said his clients were supplying a considerable number of engines up to 12-horse power. They had intended to ask that the limit in the Bill should be increased to 2 million cubic feet, because the 1 million limit would enable the promoters to supply gas-engines of 6-horse power and under, which would very materially interfere with the trade of the Companies he represented. He asked to be heard by Counsel in reference to the matter.

Mr. PRITCHARD (Parliamentary Agent for the Wolverhampton Corporation) said he did not know how far the amendment might affect his clients. In consequence of an agreement in the Bill, the Wolverhampton Corporation were not present. Where an agreement had been made, it should not be altered without strong reason.

Mr. BALFOUR BROWNE: I have not suggested the amendment; and I am perfectly willing to take the Bill without it.

The CHAIRMAN: If the amendment is not inserted, it means that the smaller manufacturers will have to pay more for their motive power than the large ones, does it not?

Mr. TAHOURDIN: Not exactly that. It means they will have to go to the coal gas companies instead of the Mond Company.

A NOBLE LORD: They pay more for ordinary than for Mond gas.

Mr. BALFOUR BROWNE: Certainly.

The CHAIRMAN (after a brief consultation with his colleagues) said the Committee were prepared to hear Counsel on the point on Monday.

On the inquiry being resumed yesterday, Mr. Tahourdin said his clients had very carefully considered the decision of the Committee as it affected the gas companies, and they had decided to leave themselves in the Committee's hands. They did not propose to appear by Counsel; but they asked the Committee to consider the fact that the proviso which the decision of the Committee on Friday affected, was inserted for the protection of the gas companies. After discussion, the Committee decided to strike out an amendment proposed by Mr. Wedderburn to the effect that the Company should be obliged to supply small as well as large consumers, and further to leave the latter part of clause 34 as it originally stood—viz., "Provided further that the Company shall not supply any person with gas unless such person is willing to contract for a supply of not less than one million cubic feet for a year, nor shall the Company supply gas for any private dwelling-houses." After further discussion, the following clause was sanctioned by the Committee: "If within four years from the 1st day of January, 1902, the Company had not laid down distributing mains in the borough of Walsall for a distance of not less than three miles from the south-western boundary of the borough, and are not in a position to afford therefrom such a supply of producer gas as may be required in that borough, the powers of the Company under this Act within the said borough and the Walsall Rural District Council shall cease." Mr. Wedderburn brought up a number of other clauses, which, as they affected important matters such as the purchase of the works in Walsall, were further postponed.

LEGAL INTELLIGENCE.

GREENWICH POLICE COURT.—Saturday, July 13.

(*Before Mr.* C. E. T. D'EYNCOURT.)

Lewisham Borough Council v. Crystal Palace District Gas Company—The Alleged Purification Nuisance.

On the case being resumed to-day,

Mr. MUIR stated that he was now in a position to do what he was unable to do at the previous hearing—that was, to state what was the cause of the nuisance, and how it could be remedied. An expert who had been called in by the Borough Council had viewed the works, and had seen exactly what was wrong. He should ask his Worship to deal with the matter under sub-section 2 of section 21 of the Public Health (London) Act, 1891.

Mr. *E. H. Stevenson* was then called. He stated that he inspected the Company's plant on July 11. For the water gas, there were five purifying boxes, 40 ft. by 20 ft., three of which were used for lime and two for oxide. For the coal gas there were twelve lime boxes, 40 ft. by 22 ft., and oxide boxes besides. The maximum quantity of gas made was 6¾ millions per day, of which about 25 per cent. was water gas, or 1,562,000 cubic feet. The lime purifiers were not sufficient in area for the coal gas to permit the whole of the sulphuretted hydrogen to be either driven forward or fixed in the lime boxes by the carbonic acid gas; and therefore, when a box was changed, there was a smell from the sulphuretted hydrogen. As it was at present, he considered the purification could not be carried on without creating a nuisance; but it could be got over by having a larger area of purifying boxes. He considered the apparatus for the purification of the water gas was put down to deal with one section only of the producing plant. There were five purifiers of sufficient area, but he considered there should be six. There should be four lime purifiers and two oxides; and then the first purifier need not be changed until the carbonic acid gas showed on the third purifier. As it was, they had to change when it showed on the second purifier; and by that time the lime in the first purifier had not thoroughly carbonated. Then there was a nuisance when it was changed. In the case of the oil gas, it was rather accentuated owing to the pungent odour from the oil. He thought the cure was to be found in putting down four lime purifiers instead of three, and only using one section of the producing plant.

By Mr. D'EYNCOURT: If both sections were put in use at the same time, another set of purifiers would also be required. Since 1893 the increase in the gas sold had been from 815 millions to 1180 millions; and so the purifying plant required enlarging.

Examination continued: He had had to deal with similar troubles in other gas-works. He reported upon the case of Belfast. There they did not follow his advice immediately; but they did afterwards. They first tried the Claus process; but it was not a success. Then they put in further purifiers; and the nuisance was cured. Then at Norwich there was a nuisance from the spent lime; but that was not exactly the same as here. On his visit to the Crystal Palace works, he saw some spent lime; but it had been lying for some time, and the outside was thoroughly odourless. But digging into it about a foot, he found it was of a dark green colour, and very hot indeed, showing that there was sulphur there, and that the air was acting upon it. With sufficient purifying area, the spent material would not have been in this condition.

By Mr. D'EYNCOURT: Each purifier in the coal gas section had an area of 880 feet; but, as at present worked, each purifier should have for the maximum make of gas at least 1172 feet. He should prefer more; but he thought the nuisance could be cured by that proportion of purifier space.

Examination continued: If he were advising the Company, he should say 1450 feet for each purifier. It only meant capital outlay. There would be no more cost in working; and the lime would probably last longer.

Cross-examined: As a resident engineer, he had had no experience of water gas plant. If the area of the purifiers was insufficient, the gas would not necessarily go forward in an impure condition; but the area might be insufficient for purifying without a nuisance. He could not state the purifying areas that the Metropolitan Companies worked to; but he knew the areas he always advised for proper working. The whole position as to the area of the purifiers lay in this: What was the size of purifiers required for having the first one free of sulphuretted hydrogen when it was changed. This question of purification was the only difficulty he could point to in the works. They were well managed. He did not know of any gas-works within a radius of 20 miles of London that had purifying plant for the water gas on the scale that he suggested should be used here; and he could not give the exact proportions used. As to the adequacy of purifiers, he should judge this by what the first purifier turned out. If it turned out lime having sulphuretted hydrogen, he should say at once that those purifiers were not large enough, or that they were insufficient in number. The whole thing lay in this: That if the sulphuretted hydrogen could be drawn a little bit further (and they would be able to do this with an additional lime box), they would find the first box would be thoroughly carbonated instead of having sulphuretted hydrogen in it. Although the make of coal gas had been greatly increased between 1893 and 1900, the lime purifiers had not been enlarged; and he would not admit that they were so much in excess in 1893, as to be capable of dealing with the production in 1900.

Re-examined: If they continued passing the gas through the purifiers until the first one was thoroughly carbonated, there could be no nuisance; and they could only do this by having the purifiers of sufficient area.

Mr. D'EYNCOURT remarked that Mr. Ryde was in a difficult position. There was evidence of a nuisance here; and the question was, were the Company prepared to remedy it.

Mr. RYDE observed that his Worship had only heard the evidence of one side; and he (Counsel) thought the evidence as to the nuisance was much exaggerated. He admitted they came within the section, if he could not prove that they were employing the best practicable means for preventing a nuisance. The statutes imposed on the Company a high degree of purity—as high, or practically as high, as in any of the big Metropolitan Companies; and, in considering the meaning of the words "the best practicable means" in section 21 of the Act of 1891, one had to take into account all the circumstances of the manufacture to which they were applied. The means which they had adopted were the best known to science.

Professor *Vivian B. Lewes* stated that he had known the Company's works for the last ten years; and he visited them as recently as June 13. The work of purification as carried out there was certainly as good as he knew of in any gas-works in the Kingdom. Witness was proceeding to explain the differences in purification between coal gas and water gas, when

Mr. D'EYNCOURT interposed, and said he did not think Professor Lewes need go into that. Replying to questions by his Worship, witness said he did not agree with Mr. Stevenson that a larger purifying area would stop the nuisance, supposing it existed. He did not think it was a question of degree at all; but purely a chemical question. In his opinion, the existing coal gas purifiers were ample for three times the present make; seeing that the purifiers were equal to the Company's maximum make of coal gas, which was about 4 millions in the winter. He readily admitted that the larger the quantity of gas made, the larger the area required; and, in regard to the water-gas purifiers, he thought the present plan of three lime purifiers and two oxides ought to do the work thoroughly well. Undoubtedly four lime purifiers would be an advantage, from the point of view that they would not need to be changed so often.

Examination continued: He did not agree with Mr. Stevenson that each section of water-gas plant required four lime boxes and two oxides. It would be a luxurious arrangement. The purifiers would do exactly the same as Mr. Stevenson suggested by running them for a longer period. As the carbonic acid in the gas came forward, so it drove on the sulphur; and if they continued running until the carbon dioxide showed on the third box, the oxide of iron box would catch the whole of the sulphuretted hydrogen, and keep it back.

By Mr. D'EYNCOURT: If there was a great nuisance, it must be due to improper working. That was the only other solution. It struck him, however, that the management and working at these works was as good as any he had seen.

Cross-examined: Witness agreed that they could get a pure gas that would satisfy the Acts of Parliament, while they had lime in the first purifier that was not thoroughly carbonated. If they took the lime out in that condition, they would have sulphuretted hydrogen, which would create a nuisance. A greater area of lime purifiers would enable them to successfully run the gas through the first purifier; but the same thing could be done by running longer with the present area.

Witness asked to be allowed to say that Mr. Stevenson had calculated his estimate of purifying space upon the maximum make of 6 millions; but at the time the complaint of nuisance was lodged, the works were only making 3 millions—just one-half, which was the same thing as doubling the area of the purifiers. So he (witness) held that doubling the area would manifestly not make the difference suggested.

Mr. MUIR: But if this nuisance is created with that quantity of 3 millions, how much greater would the nuisance be if 6 millions were being turned out?

Witness: I should think about double. (Laughter.)

Dr. *Thomas Stevenson*, late Lecturer on Medicine at Guy's Hospital and Vice-President of the Institute of Chemistry, stated that he had, in company with Professor Lewes, seen the purifiers opened at the Crystal Palace Gas-Works. The system of purification as there applied was the most satisfactory known to modern science. At the time of his visit, he made tests as to the amount of sulphuretted hydrogen that was escaping; and the results were satisfactory. He thought the purifying area was adequate. It was certainly so for the amount of gas that was being made at the time of his visit.

By Mr. D'EYNCOURT: He did not know the amount of gas that was being made on the date of his visit; but on April 26 the quantity of coal gas produced was 2,189,000 cubic feet, and of oil gas about 689,000 cubic feet—together 2,878,000 feet. The average at that time would be (say) 3 millions. The maximum quantity made in the winter was 4,315,000 of coal gas, and 1,691,000 of oil gas—together 6,006,000 feet. The purifying plant was adequate for the 3 millions; and he considered it adequate for double the quantity.

Examination continued: He could find no damage to vegetation through the gas-works. The trees on the premises themselves near the purifiers were luxuriant. Trees at a distance away which were dying he found had been barked by animals; and some elm trees in the neighbourhood were evidently affected by insects. Elm trees were very apt to die. He noticed trees that were dying, and others close by quite healthy. He had examined all round the works, and could not find any oily deposit. He did not know of any works that he had seen that were freer from nuisance than these when he visited them.

In cross-examination, witness said that the sulphuretted hydrogen would not injure trees; and he presumed that the carbonic acid gas would feed them. The system of purification in use was a good one.

Mr. MUIR: We are not attacking the system.

Further cross-examined: When he made his tests one of the large purifiers was opened, to see whether any sulphuretted hydrogen would come off. He tested it close to the purifier, and at a distance of 60 yards from the cover. He, of course, found there was a little sulphuretted hydrogen; and after five minutes he got a slight evidence of it on the next purifier to windward. But in half an hour, he got no evidence of it at all from the open purifier. Shown a bottle containing a deeply coloured spent material, witness said that he did not see any of that colour when he made his tests.

Mr. *H. E. Jones* stated that he had had about 25 years' experience in purifying under the system in use at these works; and he had made this branch of gas engineering a special study. He did not agree with what Mr. Stevenson had said about the insufficient area of the purifiers. His Company in London were purifying at three works closely surrounded (and not like these works, with a large area about them) without any smell or nuisance; and they could accomplish the requirements of the Act with purifiers which were not so large by 25 per cent. as those

at the Crystal Palace works. In the case of the Crystal Palace coal-gas plant, each single set worked out to 880 feet to the million—that was to say, upon the 4 millions required in mid-winter they had 880 feet area in each purifier. Under his rule, the area would be 600 feet for the same quantity. But he was not able to get even this; and most of the London works had not so much. In regard to the water gas, he had no apprehension of nuisance at all, because water gas contained about twice as much carbonic acid as coal gas, but only about a quarter of the sulphuretted hydrogen.

By Mr. D'EYNCOURT: He did not agree that at present the area of the purifiers required enlarging. He believed the evidence that had been given was candid; and he had been struck by the statements about the oil. His conviction was that this complaint had not arisen from the purifiers at all. He had, however, formed no opinion as to where it came from. The witnesses had spoken of oil. The oil cost them 6d. per gallon; so that the Court would readily understand that the Company could not afford to scatter it about the streets. The oil, he was confident, could not have come from the purifiers. He had heard the witnesses' description of the nuisance.

Mr. D'EYNCOURT: And do you put that down to the natural operation of these works?

Witness: I have only heard what they have said. My impression is that if we knew a little more of what they spoke about, we might be guided to the cause.

Take it as we have got it now?—Then my idea is that at some time there may have been unskilful action on the part of some workman.

You put it down to improper working?—Possibly misadventure.

Examination continued: The oily deposit to which reference had been made could not possibly have come from the oil. He did not agree that the increased area of the purifiers would get rid of the nuisance if it existed.

Mr. D'EYNCOURT: Then you do not agree with Professor Lewes?

Witness: I did not understand Professor Lewes to say so.

I understood him to say increased area might be an advantage; but he did not think it necessary.—I am not going to take the position that the smaller the purifiers are, the better you can purify.

Do you say that the larger they are, the better you can purify?—No, I should not say that. But, of course, the larger they are, the longer the intervals would be between the opening of the purifiers.

Cross-examined: He was satisfied that an alteration in the purifying plant would not make any difference in the nuisance, assuming it came from the plant. Asked whether there was nothing for it then but to impose the maximum penalty, and then a continuing penalty, to stop the nuisance and make the Company work properly, he said he did not go so far as that. Questioned as to whether there was any other remedy he could suggest, he answered that they were not all profoundly wise; but if they went into this question with other experts, they might find some possible solution.

Mr. D'EYNCOURT pointed out to Mr. Ryde that the plaintiffs had suggested a remedy for better working; but he had not suggested one. The impression on his mind was (although Mr. Ryde's expert witnesses had given their evidence extremely well and candidly) that there was not sufficient purifying area.

Mr. RYDE asked to be allowed to confer with his clients.

A consultation then took place between Counsel and experts on both sides. At the close,

Mr. MUIR said they were in a position to adjourn the matter for the present. They proposed that the case should be adjourned *sine die*, with liberty to apply to have it reinstated. Mr. Jones on the one side, and Mr. Stevenson on the other, would endeavour to agree upon what was necessary to abate the nuisance. If they agreed, it would be necessary to ask for an order as to costs. If they did not agree, then they must come back.

Mr. D'EYNCOURT: I think that is very reasonable.

Mr. RYDE said he did not admit the existence of the nuisance; but they would try to satisfy the other side by means of any reasonable alterations to the works that might be suggested.

Mr. D'EYNCOURT: You agree to the adjournment?

Mr. RYDE said he suggested the case should be adjourned *sine die*, with liberty to either side to apply to reinstate it. He added that he believed they could have satisfied his Worship that the alleged damage to vegetation was pure imagination.

Mr. D'EYNCOURT: Then the case is adjourned *sine die*.

WESTMINSTER COUNTY COURT—Wednesday, July 3.

(*Before His Honour Judge* LUMLEY-SMITH, K.C., *and a Jury.*)

Injury Caused in the Carriage of Ammonia.

To-day his Honour had before him a summons taken out by Christopher William Coxall against the Gaslight and Coke Company for compensation for injuries sustained by him owing, as alleged, to the negligence of their servants.

Mr. BLACK, Counsel to the Carmen's Union, appeared in support of the summons.

Plaintiff deposed that he was a carman in the employ of Messrs. Carter, Paterson, and Co., Limited, and had been with the firm for more than a quarter-of-a-century. On the 1st of April last he had in his cart two 10-gallon cans of ammonia, which he was taking from the premises of the Gaslight and Coke Company to Messrs. Marshall's, in Red Lion Square. He had arrived at his destination, and was drawing one of the cans by the handle towards the back of the van, to take it out, when it exploded, owing, as he asserted, to the defective way in which it had been secured—a cork having been used and tied down roughly with a rag, instead of a glass stopper. The cork flew out, and the contents were liberated, and struck him with full force in the eyes, with the result that he was temporarily blinded in both, while one eye was so badly inflamed that he had to stay away from his work for a fortnight. His weekly money was 23s.; but it was the custom of his employers to allow their old servants a commission of 1d. in the shilling on the cartage of all the goods they carried. This brought up his average weekly wages to 53s.; and it was for twice this amount—£5 6s. —*plus* compensation for the pain caused by the inflammation, that he claimed.

In cross-examination, he said he always handled things gently; and he knew that the cans had been at Messrs. Carter, Paterson, and Co.'s depôt for two or three days.

Thomas Unwin, a carman who was with the plaintiff at the time of the accident, corroborated his statements.

A yardman at Messrs. Marshall's deposed to sending the cans in question to the Gas Company's premises to be filled. As usual, he screwed in the tops of them by iron screw-stoppers, but when they came back there was a bung just stuck in one of them, and a wad of brown paper in the other. The one with the bung exploded.

The House Surgeon at King's College Hospital said he examined plaintiff after the accident, and found that one eye was very much inflamed. Luckily the cornea had not been affected, thanks to the fact that the eyes had been douched with water immediately after the accident. A fortnight was certainly not a long time for him to stay away from his work. He still suffered great inconvenience, as his eye was now afflicted with chronic inflammation. If he was carefully tended, this might be eventually cured; but it would take a long time.

William Stockley said he was foreman of the defendants' ammonia factory, and had been in the sealing department for ten years. He expressed the opinion that if the cans had not been tampered with, it would have been impossible for the bung to blow out. It would not have been safe to seal the two cans in question with iron stoppers, as the thread inside the neck was almost entirely eaten away by the ammonia. They had never had an accident before; but if cans were thrown about or jerked, some of the contents might escape. The cans were not labelled "Ammonia," as this was not usual. But the servant of the carriers signed for the receipt of the goods as ammonia; so that they knew the dangerous nature of the substance.

Mr. *T. Wilton*, the Manager of the defendants' chemical works, said the method of sealing which had been used was the best possible. The screw-stopper plan was quite a new one.

Having deliberated for a few moments, the Jury found for the plaintiff in the sum of £10.

SHERIFF COURT, DUNDEE—Friday, July 5.

(*Before Sheriff-Substitute* CAMPBELL SMITH.)

Action Against the Welsbach Company.

Judgment was issued to-day in an action by David M'Mann, incandescent fittings merchant, of 241, George Street, Aberdeen, against the Welsbach Incandescent Gas-Light Company, Limited, carrying on business at 28, Whitehall Crescent, Dundee, and at Westminster, in which the pursuer seeks to interdict the defenders, their servants, and other persons authorized by them, from printing, publishing, distributing, or circulating handbills or placards injurious to him, and to grant interim interdict; and also an order upon defenders to deliver up all such injurious handbills to such person as the Court shall appoint, and to grant warrant to the pursuer to destroy the same. The Sheriff refused the motion for an interim interdict, reserving the question of expenses. He said the initial difficulty about granting an interdict against an English limited liability company, also against their servants not named, or designated, against printing and publishing a placard or handbill, also against their widespread army of bill-stickers, was to form some conception of how it could be enforced. Supposing that this English Company, their Directors, printers, or bill-stickers, were all to disobey the interdict, how were they to be identified, caught, and put in prison, and in what prison were they to be accommodated? Perhaps they would overcrowd all the prisons of the country. He thought it was more in the interest of social freedom and well-being to allow the contempt and penalty due to manifest slander to work round to the cash balance of its authors both disclosed and undisclosed. He was further of opinion that, as a general proposition, the power of the law, backed up by the power to imprison, ought not to be exercised to restrain that self-assertive publication of puffs that set the authors of them into the sphere of revilers of opponents in business or in church or secular politics. The proper corrective of excess in the freedom of speech was an action for damages for slander.

The action, therefore, proceeds without interim interdict.

Vicars v. Hydro-Incandescent Gaslight Company.

In the Court of Appeal yesterday, before the Master of the Rolls and Lords Justices Williams and Stirling, Mr. C. A. Russell, K.C., applied, on behalf of the plaintiff, for a stay of execution pending the hearing of an appeal, of which notice had been given, on the ground that the verdict (for the defendants) was against the weight of evidence, and also on the ground of misdirection. One of the questions put by the learned Judge (Mr. Justice Lawrance) to the Jury was this: "Did the prospectus contain any untrue statements?" To this the answer was: "Yes." The next question was: "Had the defendants reasonable ground for believing, and did they, up to the time of the allotment of shares, believe the statements were true?" This was also answered "Yes;" but it was really a double-barrelled question, and it was stated by several of the Jury, after the trial, that the answer was only intended to apply to the second part of the question, not to there being reasonable ground for the belief; and they intended the verdict to be for the plaintiff. After a short discussion, their Lordships declined to grant a stay, which would only apply to the taxation of the costs.

At the last annual meeting of the Conisboro' Gas Company, the Directors reported a loss of £37 12s. 7d. on the year ending the 31st of March. The Chairman (Mr. Caleb Kilner) explained that the Company had found it necessary to borrow £1000, and the interest on this sum had amounted to £38. The money had been borrowed for the purpose of extending the works, purchasing prepayment meters, and laying new mains. There would have been no loss if the Company had not had this expense.

MISCELLANEOUS NEWS.

REPORT OF THE CHIEF INSPECTOR UNDER THE ALKALI ACTS.

The report for last year of the Chief Inspector under the Alkali, &c., Works Regulation Acts, 1881 and 1892 (Mr. R. Forbes Carpenter), was issued on Thursday; and, as usual, it contains, in conjunction with those of the District Inspectors, which are appended to it, much that is interesting to our readers. We confine ourselves this week to making some extracts from the Chief Inspector's report.

The number of works now registered under the Acts in England, Ireland, and Wales is 1054. Of these, 85 only are works decomposing salt, and so scheduled as alkali-works; while the remainder carry on processes which are scheduled under the Acts of 1881 and 1892. These numbers show a decrease of three alkali, and an increase of two scheduled works. There are also 127 works registered in Scotland; bringing the total number of registered works to 1181. Concerning these, a separate report is presented to His Majesty's Secretary for Scotland. The Inspectors under the Acts paid 4989 visits to works, and carried out 5431 tests. There were five prosecutions—three for non-registration, and two for "failure to use the best practicable means for preventing escapes of noxious gases, or for rendering them harmless and inoffensive when discharged." One of the offenders was a tar distiller, and he was fined in one case £3 and in another £2, and special costs; while a local authority were fined £20 for offending in connection with the manufacture of sulphate of ammonia. Mr. Carpenter expresses regret that the number of manufacturers against whom it was necessary to enter proceedings shows no diminution. In addition to those cited, in two instances of non-registration the Local Government Board accepted back fees in lieu of penalties for the period during which operations were carried on without registration. The circumstances which caused the fine in the case of the local authority arose from the continued use of plant which had been condemned as inadequate.

Passing over the portions of the report dealing with alkali and wet copper works, we come to that in which Mr. Carpenter offers some remarks upon alkali waste works. He states that the extraction of sulphur from alkali waste by the Chance-Claus process is in operation at nine works in England, and is carried on in Durham, Lancashire, Worcestershire, and Gloucestershire. By far the greatest development is in the two first-named counties; the manufacture in Lancashire being very considerable, both in number of works and in scale. No successful method of utilizing the residual gases from the sulphur "flowers" chamber has yet found place in any works. Where conditions have allowed of it (and the cases have been rare), a certain portion of these gases has been conveyed to the pyrites burners of the vitriol chamber process. It is estimated that the portion unrecovered is fully 12 per cent. of the sulphur extracted as sulphuretted hydrogen by the Chance process from the alkali waste, but leaving the Claus process as sulphuretted hydrogen and sulphurous acid in varying proportions. Hitherto the supervision of the process has been directed largely to preventing escape into the atmosphere of sulphuretted hydrogen. The conversion of this into sulphurous acid has been considered to be the first step in the direction of subsequently utilizing this waste product. When such gases with a high acidity are conveyed to a chimney, the gases escaping from the whole works by this outlet often have their acidity raised to a very serious extent. Dr. Affleck and Mr. Jackson, two of the District Inspectors, call attention, by comparative tables, to the extent to which this factor of the Chance-Claus process contributes to the acidity of the atmosphere of the neighbourhood in which the works are situated. Mr. Carpenter remarks that it is certainly not too much to say that, if the gases contained an amount of sulphuric acid equal to that indicated, the resultant nuisance and the damage to any neighbouring vegetation would be of a most serious character. He quotes a long passage from the Seventeenth Annual Report, contributed by his predecessor, Dr. Angus Smith, in which attention is directed to the superior powers of diffusion possessed by sulphurous as compared with sulphuric acid.

The next subjects dealt with are sulphuric acid works, the concentration of this acid, and chemical manure works; and then Mr. Carpenter comes to a group with which our readers are more closely connected—viz., sulphate and muriate of ammonia and gas liquor works. The reports of the District Inspectors, to be noticed later, give a record of the progress made in the various methods adopted for complying with the requirements of the Act of 1881 concerning these scheduled manufactures. The methods employed vary considerably; but the Chief Inspector says "there is no question that, with the exercise of proper skilled and chemical supervision, the utilization of the sulphuretted hydrogen for conversion into sulphuric acid in the vitriol chamber process is the most economical and satisfactory method known, if the percentage of this gas in the residual gases from the saturator reaches 20 per cent." He points out, however, that it demands that the manufacturing operation must be on a considerable scale, and also, of course, the existence of vitriol chamber plant. Public attention has been directed to the economic capabilities of the process in various inquiries held by the engineering officers of the Local Government Board during recent years, in respect of loans to municipal authorities for the purpose of working up the residuals of their gas-works. In such inquiries, when opposition to the schemes promoted takes definite shape, opportunity is presented for arriving at an estimate that will stand criticism at every point. Mr. Carpenter says "it has been clearly proved that no financial obstacle exists, and that the process has satisfactorily emerged from the ordeal to which it was subjected." It is well, he remarks, that the question has at length been disposed of.

On the subject of oxide of iron purification, Mr. Carpenter makes the following remarks:—

Where the system of oxide of iron purification is employed, and more than one purifier is attached to a plant, so that the material in one or more is revivifying while another purifier is coupled up to the plant evolving the foul gases to be purified, it is essential, for the safety of those engaged in attention to this part of the plant, that absolute severance by a water seal or lute be the method employed for isolating a purifier for emptying when the remainder of the plant is still kept at work. In past years, reliance has been placed on screw-down valves of varying construction. Experience has shown that no confidence whatever can be placed on these as efficacious in preventing return of the foul gases to those engaged in emptying and refilling a fouled purifier. Either work must be entirely suspended on the still for distilling gas liquor (and strict rules be made by the managers as to the observance of this), or valves of hydraulic type be substituted for the inefficient screw-down valves. The latter course is undoubtedly the better of the two; it relieves the manager, moreover, of a certain responsibility, however strictly his rules may have been drawn up. Experience also has shown that the proportion of two idle purifiers to one working is decidedly more economical in labour than one to one, where the periods of work and idleness are of comparatively short duration, as is now so often the case in working this method. Advantages are to be gained by providing a light roof over the purifiers, such roof to be supported at an elevation above the top of the latter, so as to admit of free ventilation all round, and of free access to the oxide for emptying and refilling, yet protecting the material from deterioration by being soaked with rain—a condition which not only puts back-pressure upon the saturator, but leads to the escape of noxious gases by cracks in the purifying material, such escape taking place by the way of least resistance.

It appears from the report that two processes for dealing with the foul gases were proposed during the past year, one of which is the adaptation of an old principle—the separation of sulphur from sulphuretted hydrogen as sulphur by employing a solution of a ferric salt (preferably sulphate); the regeneration of the produced ferrous salt to the ferric state being accomplished electrolytically from a dynamo. The possible use of ferric salts in dealing with such gases as saturator gases had already been mentioned in Mr. Carpenter's reports to the Secretary for Scotland for 1898—the original suggestion having come from Mr. Curphey, and the work of investigation on gases containing about 10 per cent. of sulphuretted hydrogen having been carried out in the Chief Inspector's laboratory. Experiments on this process, as patented by Mr. A. M'Dougall in relation to the purification of coal gas,* have been carried out at a registered works on a small working scale—larger than that of a laboratory—but as yet only with coal gas. Mr. Carpenter has been informed that, as regards the removal of sulphuretted hydrogen, recent results obtained are promising. With regard to the second process, which is based on the formation of ferrous sulphite from ferrous sulphate and ammonium sulphite (previously formed in an easy manner described by the patentee, Mr. H. Hemingway), the foul gases are brought into contact with a solution, or with water containing ferrous sulphite in suspension. Reaction takes place with separation of sulphur. Investigation in the Chief Inspector's laboratory, however, showed that a material loss of sulphur takes place through formation of thiosulphate, the sulphur in which is lost as far as the process is concerned.

We now come to the portion of the report dealing with the recovery and production of ammonia. Through the courtesy of manufacturers, Mr. Carpenter is enabled not only to continue the table given for several years past on the produce of ammonia from all sources in the United Kingdom, but, by the sanction of those engaged in the recovery of bye-products from coke-ovens, to make it more instructive by the inclusion of a new sub-head—ammonia recovered from coke-ovens. He points out that the growth of this industry has been comparatively rapid of late years, after a long period in which no progress seemed to result owing to the scepticism of ironmasters as to the behaviour of "recovery" coke in the blast-furnace. Several new plants started operations in the past year; but their full effect in adding to the production of sulphate will not be apparent until the present year comes under review. The following is the table as extended:—

—	1900.	1899.	1898.
Gas-works	142,419	133,768	129,590
Iron-works	16,959	17,963	17,935
Shale-works	37,267	38,780	37,264
Coke-oven works	10,393	7,849	5,403
Producer gas and carbonizing works (bone and coal)	6,688	7,360	6,165
Total	213,726	205,720	196,357

Note.—The figures here given for production in 1899 differ somewhat from those presented in the report for that year, an error having occurred in the returns from one district. This was not discovered until the report had been issued; but opportunity is now taken to present the correct figures.

It will be seen from these figures that the most important contributor still, of course, remains the gas industry; the figures showing a substantial increase over those for 1899. Mr. Carpenter remarks that the extension of water gas has not been inconsiderable, and would probably have acted still more powerfully as a factor in checking the increased production of ammonia from the carbonization of coal in the illuminating gas industry, if it had not been for the great rise in the values of petroleum residues used in carburetting water gas—a rise that was greater in proportion than that of other enriching raw material, such as cannel coal or benzol. There is also, he says, a certain amount of hesitation in the adoption of any form of carburetted water-gas process which has to be reckoned with as a factor militating against extension, arising from the circumstance that the intentions of Parliament in regard to the limitation by statute of the proportion of carbon monoxide that may exist in illuminating gas sent out for consumption have not yet been indicated; no action, so far, having followed the report of the Departmental Committee appointed by the Home Office to investigate this matter. The figures for amounts recovered in the important shale distillation industry in Scotland, and from the coal-fed blast-furnaces—an industry almost exclusively confined to Scotland—receive comment in the Chief Inspector's report to the Secretary for Scotland, which will be noticed later. Both show some reduction compared with those of the year 1899. This portion of the report closes with a few

* See "JOURNAL," Vol. LXXV., p. 151.

remarks on the Mond gas scheme as bearing upon the production of ammonia and the supply of motive power.

Mr. Carpenter understands that ammonia recovery is only commercially feasible for large units of plant, where 40 tons a day, at least, of coal are converted into fuel gas. This has, he says, tended to check the rapid development of a system in which great technical perfection has been attained.

Those of our readers who have followed with interest Mr. Carpenter's annual reports, will remember that he has devoted a considerable portion of those for the past few years with records of his examinations of ammoniacal liquors. In the report just issued, he gives the results of those made last year; and, as far as liquors produced from English sources are concerned, they will be found in the accompanying table. In his report to the Secretary for Scotland, additional results are recorded of liquors derived from the distillation of various kinds of shale used in paraffin oil works in Linlithgowshire and Midlothian, the great centre of that industry in Scotland. As on only one occasion during the whole of these researches, extending over five years, has ammonium ferrocyanide been identified with certainty, and then only in traces, he has omitted this column. There is, however, an additional one to take its place, as in some liquors evidence has been found of the existence of ammonium sulphite. In a subsequent section of his report he deals with the conditions under which the presence of this body is possible.

The Chief Inspector next takes up the subject of the conditions

Analysis of Ammoniacal Liquor.

Liquor.	Degrees Twaddel.	Chloride, calculated as HCl, per Cent.	Distribution of Sulphur (per Cent.). As Sulphate.	As Sulphocyanide.	As Thiosulphate.	As Sulphite.	As Polysulphide and other Forms (by Difference).	As Sulphide.	Total Sulphur per Cent.	Per Cent. Sulphur to Ammonia.	Ammonia. Total, per Cent.	Fixed, per Cent.	Free. Per Cent.	Free. A. H.E.	Carbonic Acid. Per Cent.	Carbonic Acid. B. H.E.	Sulphuretted Hydrogen. Per Cent.	Sulphuretted Hydrogen. C. H.E.	Total Acids (B + C); H.E.	Difference of Acids (B + C − A) H.E.	Difference of Acids (B + C − A. NH_3, H.E. = 100).	Per Cent. of Total Acids as H_2S.
Coke-Oven Gas-Works. 1	6·50	1·390	0·88	19·71	7·45	..	+6·74	65·22	0·7119	25·02	2·845	0·8500	1·9950	117·35	2·3850	108·40	0·4934	29·02	137·42	+20·07	+17·10	21·12
2	5·80	0·319	3·54	10·22	10·23	..	+7·12	68·89	0·6218	27·88	2·230	0·2850	1·9450	114·40	2·0350	92·50	0·4552	26·78	119·28	+ 4·88	+ 4·27	22·50
3	4·75	0·369	0·40	4·15	5·91	..	−3·81	93·35	0·5428	29·85	1·818	0·2240	1·5940	93·77	1·8370	83·50	0·5383	31·67	115·17	+21·40	+22·82	27·50
Producer Gas. 1	5·60	1·618	3·70	11·00	15·75	..	−4·65	74·20	0·2108	9·33	2·2585	0·7922	1·4663	86·25	1·8535	84·25	0·1663	9·78	94·03	+ 7·78	+ 9·20	10·40
2	2·75	0·065	16·12	3·43	43·59	37·71	−0·85	..	0·2707	46·50	0·582	0·1800	0·4020	23·65	0·5865	26·66	..	..	26·66	+ 3·01	+12·72	..
1	12·50	7·494	31·12	5·43	47·21	..	+16·12	..	0·4770	13·39	3·268	3·1420	0·126*	..	..	..	..	..	..	..	..	..
2	13·50	0·236	25·70	..	58·71	13·85	+ 1·74	..	3·5580	13·72	2·586	2·5510	0·035*	..	0·1070	..	..	..	..	..	..	..
3	19·50	16·69	24·21	..	53·51	..	+22·28	..	0·3751	5·46	6·865	6·7830	0·082*	..	..	..	..	..	..	..	..	..

Note.—Traces of cyanide were found in the liquor from gas-works and in the first sample from the coke-ovens; but it was absent from all the rest.

* This represents amount of ammonia evolved during first half-hour's distillation. At the end of this time soda was added and the distillation continued for "fixed" ammonia. Prolonged boiling failed to expel all the "free" ammonia, and the amounts stated under this heading in the above table must only be taken to indicate that the amount of ammonia evolved on boiling the solutions is small. No quantitative meaning can therefore be attached to these figures.

under which oxidation of ammonium sulphide in gas liquor occurs. In his report for 1899, he was able to present some results, obtained from gas-works, bearing on this matter. He then directed attention to the necessity for recognizing, as a possible reaction contributing to the general result, that this sulphate might be formed, according to an equation which he gave. He found, on further examining the conditions existing between the retort-house and the condensers, that, in a gas-works, progress would hardly result in following up this inquiry on the necessary lines, owing to the presence of small, but varying, percentages of oxygen in the crude gas leaving the retort. Conditions, however, were more likely to give indications of the presence or formation of ammonium sulphite (if formed) in certain types of producer gas and of coke-oven plant combined with ammonia recovery, where the absence of free oxygen was also practically assured. Through the courtesy of manufacturers, to whom Mr. Carpenter conveys his thanks, the desired samples were supplied to him. They extended beyond the liquors to the muds accumulating in the mechanical washers forming part of such plants, where first the heated gases meet with liquid, and condensation takes place. As in some cases the water supplied to the washers contained calcium salts, it seemed possible that insoluble calcium sulphite might be found in the mud, even if ammonium sulphite were absent in the wash liquor. On reference to the accompanying table, it will be noted that in No. 1 producer gas sulphite was traced in the mud when absent from the liquor; in No. 2 it was present both in liquor and in mud; in No. 3 it was absent from both; while in coke-oven liquor No. 2, where sulphite was present in very considerable proportion, there is no mechanical scrubbing or washing of the gas, but only a slow process of condensation by cooling :—

Mud.	Per 100 Grammes of Undried Mud. Thiosulphate. Sulphur.	Sulphite. Sulphur.	Moisture.	Remarks.
	Grammes.	Grammes.	Grammes.	
No. 1 .	0·33	0·24	44·5	Mud resembles coal-dust. On drying and igniting combustible gas is given off, leaving grey ash.
No. 2 .	0·78	0·68	60·0	Character of mud, and composition of ash similar to No. 1 above.
(Mother liquor)	0·55	0·07	..	
No. 3 .	Absent	Absent	..	Viscid, tarry mass. Burns with yellow smoky flame, leaving considerable amount of red-brown ash.

Analyses of Ash: No. 1.—Traces of iron oxide, alumina, and lime; magnesia absent. No. 3. Iron oxide, alumina, and lime present; small traces of magnesia.

Analyses of Coal Used (*No.* 3.)—Chloride = 0·18 per cent. HCl. (*a*) Water extract—Iron oxide and alumina absent; small traces of lime and magnesia. (*b*) Hydrochloric acid extract—Traces of iron oxide, alumina, and lime; small traces of magnesia.

In the succeeding portions of his report, Mr. Carpenter deals further with the analysis of ammoniacal liquor, the oxidation of gas liquor by air in stoppered bottles, and other matters; concluding with some remarks on tar-works. In regard to the last, he says, the year's work was characterized by absence of serious complaints in respect of the operations carried on. In many cases the plant was improved, or new plant on modern lines of construction erected to replace that of older type, the working of which was uneconomical or inefficient in regard to the requirements of the Act governing the escape of noxious and offensive gases. In last year's report, mention was made of experiments being conducted at one works to deal with the waste gases from the worm-ends of the stills by a wet method of purification. Further experience at these works has been attended with satisfactory results. Mr. Carpenter is not at liberty as yet to speak in detail of the method employed. The principles, however, of the chemical reactions desired are old and well known, and have received application in former years to the foul gases from sulphate of ammonia manufacture. A trial of the method, however, at another tar-works where the conditions of distillation were different, resulted in failure. Back-pressure through accumulation of an insoluble precipitate of very dense nature led to the abandonment of the process. It became a subject for inquiry why the chemical reactions obtained were so divergent. The conclusion arrived at was that in the difference of conditions of distillation must be sought the differences of reaction in the purifiers; periods of rest for the material in the latter being found not only desirable but essential. Mr. Carpenter notes with regret that the importance to gas managers of the subject of liability to accumulation of mixtures of explosive gases in tar-wells received further illustration last year; an explosion attended by loss of life having occurred at a gas-works in Lancashire.

Other portions of the report will be noticed in subsequent issues.

WIDNES GAS AND WATER SUPPLY.

The Past Year's Working—A Scott-Snell Lamp to be Tried.

At the Meeting of the Widnes Town Council last Tuesday—the Mayor (Alderman G. I. Neil) presiding—the minutes of the Gas, Water, and Electricity Committee were under discussion. In the course thereof, it was stated that the subject of intensified gas for street lighting had been brought forward at the recent meeting of the Gas Institute; and that, in view of the high duty claimed for the Scott-Snell lamp—35 candles per cubic foot of gas, compared with 16 to 18 candles with an ordinary incandescent burner—it had been decided to fit up one in the Square, and observe not only its lighting efficiency, but the effect of the atmosphere on the mechanism of the intensifying device. There had been 4058 applications for a supply of gas through prepayment meters; and 3891 houses had been fitted up on this system. The Borough Accountant (Mr. S. Hoyle) submitted statements showing the profit on the gas account in the past financial year (exclusive of the cost of public lighting, £1607 17s. 10d.) to have been £963 14s. 9d.; and on the water account £1404 11s. 8d.

Alderman Timmis, in moving the adoption of the minutes, drew attention to the reference therein to the subject of intensified gas lighting, and informed the members that after the meeting they would have an opportunity of inspecting a large lamp, which the Engineer (Mr. Isaac Carr, M.Inst.C.E.) had obtained, and which it was intended to put on trial. They were making the experiment with the idea of improving the lighting, if possible. Referring to the revenue accounts relating to the gas and water undertakings, he said the total quantity of gas sold during the past Corporation year showed an increase of 6·37 per cent.; the total number of ordinary consumers had augmented by 4 per cent.,

and the slot meter consumers by 4·75 per cent.; while the additional number of stoves out on hire was 10 per cent., which was very satisfactory. There had been an increase of 4·89 per cent. in the water sold for trade use; but for domestic and sanitary purposes he was sorry to say there was a decrease. On the total, however, there was a rise of 2·42 per cent. Turning to the working of the undertakings during the year, he pointed out that the conditions had been very bad. In the purchase of coals for the gas-works there had been an extra expenditure of £5278, which, for a small business like theirs, was a very big item. They had already bought a great deal of their coal for the current year at reductions which would show a saving of £5000 in the expenditure on the year's working. They had also had in the past year some other extra expenses to meet. They had been reconstructing one of the retort-houses, which had been done out of revenue. They had consequently had to use one of the older houses, which was not up to modern requirements; so that additional cost was entailed in the working. Upwards of £1000 extra had been expended in the reconstruction of retorts, and this, too, had been paid out of revenue. The cost of repairs, wages, &c., had also been higher. But though they had spent more than £5000 extra in coal during the year, owing to the increase in prices, he would point out that, contrary to the experience of every other gas committee in the country, they did not raise their prices to meet that expenditure—in fact, they reduced the price to the consumers of gas for motive power, and in that way stood alone throughout the country. The figures he had given would show that the profit on the gas account amounted to £963 14s. 9d. This was profit on the concern as a commercial undertaking, and was the total of the profit and loss account for the year. The balance-sheet, however, was a different thing. That showed a loss of £644 3s. 6d. on the whole year's working. If they would consider this by the fact that the public lighting was paid for out of the profits of the gas undertaking, and take £1607 17s. 10d. from the £963 profit they made on the actual working, they would find that at the end of the year they were £644 out of pocket. The profit on the water account was £1404 11s. 8d.; but they would have to defray the cost of the Fire Brigade, which amounted to £219 11s. 9d.—thus reducing the profit for the year to £1184 19s. 11d. These figures were most gratifying to the Committee. They spoke for themselves, and showed clearly that all the work had been well done.

Alderman QUINN thought the Council ought not to allow the minutes of the Gas and Water Committee to pass without complimenting them on their year's admirable work. Considering all the circumstances and the hardships they had to face at the commencement, and also the fact that not only were they able to surmount the difficulty without increasing the price of gas, but had actually been able to reduce it to a certain class of consumers, he thought it spoke well for the work that had been done. He considered it was their duty, when they found that the Committee were doing their utmost to put money into the pockets of the ratepayers, to compliment them. At the same time, he was of opinion that the Chairman might have stated in the minutes in regard to the gas account what was actually the loss. It had prior to this year always been customary to add the cost of the public lighting to that account. But though the account showed £644 3s. 1d. on the wrong side, he thought they had finished in an excellent manner. He found that the average price paid last year for coal was 13s. per ton, whereas this year it was only 8s. 7d.

Alderman TIMMIS thanked Alderman Quinn sincerely, on behalf of the Committee, for the kind expressions he had used with regard to their work during the past twelve months. The credit, however, was due to those who earned it; and while the Committee had done their utmost, the praise undoubtedly belonged greatly to the officials, who, he was satisfied, would very much appreciate the remarks that had been made. With regard to the way in which the figures had been shown, he said, as far as he remembered, they had never had a deficit before; but he assured the Council that the idea was not to mislead anyone. He had gone into the matter thoroughly. The gas undertaking as a trading concern was perfectly solvent, and was earning the profit as explained.

The minutes were then adopted.

Meter Inspectors' Wages at Bolton.—The Gas and Lighting Committee of the Bolton Corporation have adopted the following scale of wages for the meter inspectors: First year, 24s. per week (minimum); second year, 25s.; third year, 26s.; fourth year, 27s.; fifth year, 29s.; sixth year, 30s.; and seventh year and after, 32s. (maximum).

Gas Coal Contracts for Birmingham.—The Gas Committee of the Birmingham City Council met on Monday last week, and completed their coal purchases for the year ending June, 1902. Contracts were placed for considerably more than 500,000 tons, at a cost which would effect a saving of something like £100,000 compared with the prices a year ago. Notwithstanding the reduction, the prices for the current year's supply are higher than those ruling prior to the 5s. increase.

Gas Cookers at Middlesbrough.—A report as to the hiring of gas-cooking stoves has been presented to the Gas Committee of the Middlesbrough Corporation. Inquiries were made at seventeen towns, and it appears that the ten-years hire-purchase system is the most favourable to the Corporation and the consumers; that the first quarter's instalment is usually paid when the agreement is signed; and that most Corporations are now giving up ordinary hire, and adopting the hire-purchase system. In Middlesbrough there are 1500 cookers in use, and upwards of 300 supplied on hire or sold by the local plumbers.

Electrolysis at Birmingham.—At the meeting of the Gas Committee of the Birmingham Corporation on Monday last week, there was submitted for inspection a piece of iron gas-pipe, about 1½ inches in diameter, a portion of which had been completely fused by an escape of electric current in Castle Street. The explanation suggested was that, owing to the expansion and contraction of the insulating material, cracks occasionally occur, into which moisture penetrates, so affording a conductor to the nearest adjacent metal. In the present instance, the gas-pipe was fused near the point where it was crossed by the electric conductor.

GAS AND WATER ORDERS OF THE SESSION.

The Board of Trade have published, in the usual form, particulars as to the nature of the proposals contained in the Provisional Orders included in the Gas and Water Orders Confirmation Bills of the present session.

The Gas Orders Confirmation Bill includes Orders relating to Horsham, Nuneaton, Pinner, and Swaffham. The first is to sanction the maintenance, and the second and third are to authorize the construction, of additional works; and further capital will be required by the Nuneaton and Pinner Companies. The Swaffham Order is to sanction the maintenance and continuation of works and the manufacture and supply of gas in the parish and urban district of Swaffham, and for other purposes. The Gas and Water Orders Confirmation Bill contains Orders relating to Bexhill, High Wycombe, Portsea, Slough, and Woking. The Bexhill Water and Gas Company wish to raise more capital and purchase additional lands; and the Order applied for is for these and other purposes. The High Wycombe Gas Company, Limited, desire to extend their area of supply, and to be empowered to raise further capital. The Portsea Order is to authorize the Portsea Island Gas Company to acquire more land, construct and maintain additional gas-works on a new site, and raise further capital. The Slough and Woking Companies ask for extra capital.

The Orders in regard to water supply are contained in two Bills. In the first are included those relating to Frimley and Farnborough, Henley-on-Thames, Hungerford, South Staffordshire, and Wokingham; in the second, the Dearne Valley, Mid-Kent, Perranporth, Slough, and Tilehurst and District Orders. The Dearne Valley, South Staffordshire, and Wokingham District Water Companies require additional capital only; the Frimley and Farnborough Company wish for more money, and for authority to purchase further lands by agreement; the Henley and Slough Companies likewise want capital and also an extension of their limits, and the latter request is put forward by the Mid-Kent and Tilehurst Companies. The Hungerford Order is to authorize the construction and maintenance of works and the supply of water in the parish of Hungerford, in Berkshire; and the Perranporth Order is for a similar object in respect of portions of the parishes of St. Agnes and Perranzabuloe, in Cornwall.

SUGG'S STREET-LANTERNS FOR INCANDESCENT GAS-LIGHTING.

The Specification Amended.

In the "JOURNAL" for the 9th of April last (p. 948), we described, in the "Register of Patents," a method devised by Mr. William Sugg of adapting to the lanterns of street-lamps an appliance which, while providing a free opening for a lighting-torch, without permitting the entrance of gusts of air, would be automatically closed on withdrawing the torch. It consisted of a cradle to receive a rolling-valve, having at one end an opening to permit of the entrance of a torch; the opening being automatically closed by the rolling-valve when the torch was withdrawn. Mr. Sugg made two claims in respect of his invention, substantially as set forth above. His application was opposed by Mr. George Bray, on the ground of a patent of his own (No. 970 of 1882) and of Lamb and Lamb (No. 12,709 of 1886), both of which had expired. The matter came before the Comptroller-General of Patents (Mr. C. N. Dalton) on the 2nd inst., when Mr. Newton appeared for the applicant and Mr. Walter represented the opponent. The latter pointed out that Mr. Bray's patent was, "for closing automatically the hole at the bottom of a lantern, the use of a ball of larger diameter than the hole;" and he contended that Mr. Sugg's first claim could not stand in face of those words. With regard to the second claim, Counsel submitted that, even if it was to be allowed, there was so broad an indication of the fact that Mr. Sugg conceived himself to be the inventor of the rolling ball for the purpose of closing a valve, that some specific reference should be made to Mr. Bray's 1882 patent. The Comptroller asked if that was a master-patent. Mr. Walter replied that there was no suggestion that it was not, and he thought the declaration was to that effect. The Comptroller expressed the opinion that Mr. Walter was entitled to some disclaimer; and he asked Mr. Newton if he disputed that Mr. Bray's was a master-patent. Mr. Newton said he did not; the only thing was that the patent had expired, and therefore was open to anybody. He must admit that Bray's claim anticipated Sugg's to the extent of using the ball. After some discussion, the Comptroller decided that Mr. Sugg's first claim must be struck out, and a specific reference made, in the ordinary form, to Bray's patent of 1882. He amended the specification in accordance with his decision.

GOOLE GAS AND WATER SUPPLY.

The Past Year's Working.

At the Meeting of the Gas and Water Committee of the Goole Urban District Council on Monday last week, the Engineer and Manager (Mr. Matt. Dunn) presented his report and balance-sheet for the year ending March 31. They showed a continuance of the satisfactory progress made since his connection with the undertaking. According to a comparative table he had prepared, during the year 1897-8—the one immediately preceding his appointment—they made 44,870,000 cubic feet of gas; in 1898-9, they made 47,839,000 cubic feet; in 1899-1900, the make had risen to 56,780,000 cubic feet; and in 1900-01, the quantity was 58,223,000 cubic feet. The production per ton of coal has also shown a considerable increase, resulting from the new plant. In 1897-8, it was 9203 cubic feet; in 1898-9, it rose to 10,509 cubic feet; in 1899-1900, it was 10,744 cubic feet; and last year it went up to 10,754 cubic feet. Mr. Dunn pointed out to the Committee that this was a very high make, and it went to prove that the quality of coal they were getting, and the

attention paid to the details of carbonization, enabled them to obtain this large quantity of gas per ton. The gas sold showed a marked improvement. In the period taken above, it rose, in round figures, first from 38 to 41, then to 49, and last year to 53 million cubic feet; while the leakage dropped from 13·02 to 10·5, then to 9·26, and last year to 5·6 per cent. In 1897-8, the gas-rental was £6485; in the following year, it was £7302; in 1899-1900, £8236; and last year, £8689. Mr. Dunn had also prepared a summary of profits realized. In 1897-8, there was a deficit of £97. In the following year, the net profit, with a reduction of 3d. per 1000 cubic feet, was £1325; in the next, with a reduction of 2d., £1982; and last year, with an advance in the price of coal to the extent of 5s. 5·1d. per ton, but no increase in the charge for gas, and no meter-rent, £1220. Mr. Dunn expressed his gratification at the result of the year's working, which he hoped would meet with the approval of the Committee, for it was the most satisfactory report it had ever been his pleasure to present to any Council. In submitting the annual report for the Water Department, Mr. Dunn said the consumption of water had been reduced from 164,431,336 gallons per day in 1889-1900 to 158,359,437 gallons in 1900-1901. The quantity of coal used had also been decreased; but they had had to pay £166 more for coal. The cost of coal per 1000 gallons of water pumped was a little more, and wages had also increased, due to the breakdowns. Water-rentals showed a slight advance; and the cost per 1000 gallons pumped had increased from 4·489d. to 4·706d.

Mr. Blyth said he thought the reports were very satisfactory indeed, and the Council could heartily congratulate themselves and their Manager upon the unique statement which he had been able to make. Mr. Turton agreed with these remarks. He said he took it that the good results were due not only to the great exertions of the Manager and the Committee, but also to the more modern plant, which had justified the introduction of the regenerative furnaces, and in the choice which they made, on the recommendation of the Manager, of the new plant. The Chairman (Mr. J. Cawthorn) said the result of their efforts had been to show a profit, though it was not so large as in former years. But, taking into consideration the fact that coals had been 5s. 5d. a ton dearer, they were still able to show a profit of £1220; and he hoped they would pass some meed of praise to their Manager for achieving such a result. He (the Chairman) had watched and waited for the report in fear and trembling, because he knew the many difficulties with which Mr. Dunn had to contend. He had been able to surmount them all; and he thought their best thanks were due to Mr. Dunn for his administration of the works and for showing a profit. He moved a resolution to this effect. Mr. Blyth seconded the motion, which was carried, and was briefly acknowledged by Mr. Dunn.

The annual statement of accounts was also presented. It showed a credit balance of £5097 14s. 10d. from the gas revenue account, and of £2127 18s. 8d. on the water revenue account. The profit and loss account showed a balance of £7793 15s. 1d. brought from the last account, which, together with the two sums transferred from the gas and water revenue account, made gross receipts of £15,019 8s. 7d. Against this, there was charged £4114 19s. 5d. for repayment of principal and interest (£1516 being principal) and various other sums; leaving a balance of £9013 18s. 10d. net profit. The actual net profit for the year, as already stated, is £1220; being the difference between the amount brought forward on March 31, 1900, and that carried forward on the 31st of March last.

MARKET HARBOROUGH GAS SUPPLY.

The Past Year's Working.

The Market Harborough District Council had before them at a recent meeting the annual report of the Gas Manager (Mr. A. T. Harris). In the course thereof, he stated that the increase in the sales of gas to private consumers had continued to be satisfactory, as shown by the increased consumption of 1,164,100 cubic feet. During the year 40 ordinary and 35 prepayment meters had been fixed—making an increase of 75 consumers; while the number of cooking-stoves on hire was 41 more. Though the make of gas showed an augmentation to the extent of 1,511,000 cubic feet, the quantity of coal carbonized was 203 tons less than during the preceding year; while the make of gas per ton had gone up from 9564 to 10,550 cubic feet. These improved results were primarily due to the adoption of the regenerator settings, and also, to a slight extent, to the better quality of coal used. The sales of coke had increased by 134 tons; and this, together with a better average price being realized, had resulted in an improved income of £385 19s. 4d. from this source alone. Tar and sulphate of ammonia also showed satisfactory increases in the amount realized. The total receipts amounted to £7685, compared with £6757, or an increase of £928; and the expenditure to £5455, against £4595, an increase of £860. The gross profit was £2229, compared with £2161, an increase of £68; and the net profit, after payment of interest, sinking fund, and other charges, £141, against £51, or £90 more. Mr. Harris pointed out that, in comparing the results with the previous year, it must be borne in mind that, though the increase in the cost of coal amounted to 4s. per ton, or a gross sum of £564 10s., £317 10s. of the higher revenue of £444 10s. received for gas was derived from the 3d. per 1000 cubic feet increase; the remaining £127 being the amount received from the extra quantity sold. In other words, though coal had cost £564 10s. more, only £317 10s. of this amount had been obtained from the gas consumers by the additional charge made. With regard to the working of the new plant, Mr. Harris said the results foreshadowed in his report of Feb. 27, 1900, were fully borne out, as instanced by the reduced bulk of coal used in producing a greater quantity of gas, and also in the larger amount of coke sold. The capital expenditure during the past year amounted to £4458.

The adoption of the report was, as usual, moved by the Chairman of the Gas Committee (Mr. Gardiner), who remarked that, owing to the increase in the price of coal, gas undertakings had in many instances shown a deficit, and had had to resort to the rates to meet it. In view of the low price charged for gas in Market Harborough, which would bear favourable comparison with any town of similar size, it was a matter for congratulation that they had so satisfactory a report. The loan charges, principal and interest combined, amounted to 1s. 3d. per 1000 cubic feet; and the average selling price of gas was 3s. 1½d.—thus leaving only 1s. 10½d. to cover all manufacturing charges. He tendered his thanks to Mr. Harris, Mr. Hall (the Clerk), and the entire staff, for the very satisfactory results of what he might call an anxious year's work. The Chairman (Mr. J. L. Douglass) said Mr. Harris was to be congratulated on the present condition of the works, and also on the improvements that had been carried out at his suggestion. The accounts had been carefully kept; and Mr. Hall was to be complimented upon the fact that there had only been about £7 of bad debts during the whole year. Mr. Gardiner was no doubt pleased to be able to present so satisfactory a report; but they, as a Council, were particularly indebted to him for the time and trouble he had taken in the matter. Mr. Gardiner said he certainly took great interest in the gas-works, and he was pleased to have such good officials to co-operate with him.

ELECTRIC LIGHTING NOTES.

The Surbiton District Council are proposing to spend £50,000 on electric lighting. A Local Government Board inquiry has been held into the subject. It lasted between six and seven hours, as there was considerable opposition. The ratepayers do not seem able to swallow so large an order all at once.

In the House of Commons last Friday, Mr. Stuart-Wortley asked the President of the Board of Trade whether he had given any decision, or made any order, purporting to disentitle the Chelsea Electricity Supply Company from recovering an increased price per unit for current supplied to consumers who have not consented to accept current at 200 volts, in cases where the Company have not offered to defray the expense of changing the voltage. Mr. G. Balfour said the Board of Trade had issued amended regulations with respect to the changes of pressure by electric lighting undertakers, which provided in effect that when the regulations applied the undertakers must pay the reasonable costs of, or incidental to, a change of pressure on the consumers' premises; but the regulations did not purport to affect the power of charging.

A Local Government Board inquiry was held at Barrow last Tuesday with respect to an application by the Corporation to borrow the sum of £12,340 for the extension of the electric lighting system to Vickerstown and Walney Island. It was stated that 500 new houses had been completed at Vickerstown, and plans for 350 more had been passed; while Messrs. Vickers, Sons, and Maxim are going to build about 400 more. It had been decided to light the streets of Vickerstown by electricity, using 22 arc lights and approximately 100 incandescent lamps. Messrs. Vickers had entered into an agreement with the Corporation, in which they guaranteed that the revenue arising from the supply of electricity to the houses would mean not less than £1000 per annum for five years. This guarantee was exclusive of street lighting, the revenue from which would be about £600. The supply of electricity to Barrow was only commenced in 1899, when there were 43 consumers, and now there are 192; and, exclusive of Vickerstown, there are 945 lamps awaiting connection. There was no opposition.

The account which appears in our "Technical Record" of the lamentable occurrence at the Birkenhead Town Hall last Wednesday night had only just been put in type when news reached us of a companion mishap, on unfortunately a still more extensive scale. In both cases, it was only a small electric wire which caused the destruction of thousands of pounds worth of property. It seems that when an electric wire has anything to do with originating a fire, it does its dire work completely. In regard to the second conflagration (which took place on Saturday), it appears that a live electric wire fell into a mule carriage at the mills of the Jackson Street Cotton Spinning Company, Manchester, and it resulted in the gutting of the mill. A number of work-people were employed in the room in which the outbreak of fire occurred; and they were panic stricken by the rapid spread of the flames. In the rush to the doors, many were injured by clambering over the roof and by forcing a way through the windows. Fifteen injured people were taken to the Manchester Infirmary to have their wounds dressed, and two—George Darren and Mary Deeley—were so seriously hurt that they were detained as in-patients. The mill (one of the largest in Manchester) contained 85,000 spindles. The damage done is estimated at between £60,000 and £70,000.

The balance-sheet and profit and loss account of the electric light undertaking of the Portsmouth Corporation for the financial year ending March 31 has just been issued. It shows that the hopes entertained of a substantial yearly contribution towards the reduction of the rates, held out at the commencement, are not likely to be realized. The works have been in operation seven years, and during that time £179,134 has been sunk in the concern. Against this, £19,359 has been invested in the sinking fund towards the redemption of debt, and £1000 handed over in reduction of the rates; the interest on the debt meanwhile having been paid. Last year's working, instead of a profit after the interest and sinking fund payments have been made, shows a deficit of £867 11s. 8d., which means that the £1000 paid to the Chairman of the Finance Committee towards reduction of rates should have been held against the loss on the year's working, in order to save the interest on the bank overdraft. In addition to the borrowed capital, there was owing to the bank on March 31 last £6886 for overdraft, and £2096 to sundry creditors for goods supplied—a total of £8982. On March 31 last year, these two accounts stood as follows: Bank, £5060; sundry creditors, £1913—together, £6973, or an increase of £2009 owing on revenue account. On March 31 last, the amount owing by sundry debtors for current supplied was £8330; on March 31, 1900, it was £8026. This is the financial position of the electric light undertaking; and we agree with a local contemporary, to which we are indebted for the foregoing figures, that it is useless to disguise the fact that the outlook is by no means cheering.

The attention of correspondents in quest of reported instances of dissatisfaction on the part of electric light consumers may be usefully directed to some proceedings before Mr. Dickinson, at the Thames Police Court, last Friday. Henry Dodd, a baker, of Crisp Street, Poplar, was summoned for not paying an amount due for the supply of electric light. This was the first summons taken out by the Poplar

Borough Council since their adoption of electricity for lighting the streets. Mr. J. Clack, Accountant and Chief Clerk of the Electricity Department of the Corporation, stated that the defendant entered into a contract for the supply to him of the electric light, the quantity to be registered by meter. He was charged under a scale—5d. per unit for the first hour, 4d. for the second, and 3d. for all current used after. He also agreed to pay ¾d. per unit on his consumption, for the use of fittings. Defendant said he was induced to sign the agreement by one of the borough canvassers, who made false statements, and who said the light would be as cheap as gas, whereas it cost three times as much. He would take good care he would have no more electric lighting in his house, for it had become a nuisance. Men were continually wanting to inspect the meter—no less than three of these men calling in two days; while the charges were most exorbitant. He reckoned he had been swindled by lying statements. Mr. Dickinson remarked that this was the usual thing when canvassers were engaged in such work. Defendant: Besides, the more you consume, the more they charge for the fittings; and it is not so good as gas. I have now got to pay £4 2s. 6d. for testing their stuff, which went out twice, and nearly spoilt my bread. His Worship made an order for the payment of £4 2s. 6d., and 2s. costs.

Lord Kelvin visited Luton on Wednesday to inaugurate the Corporation's electricity installation, which has, with the site, cost £27,000. The works adjoin the borough highways depôt and stables. The station starts with 29 customers, the Corporation counting as three; for the light has been installed in the Town Hall, the Free Library, and the Corn Exchange. The buildings, which were designed by the Borough Engineer (Mr. A. J. L. Evans), comprise entrance hall, accumulator room (containing 280 storage cells), offices, engine-room, boiler-house, pump-room, and coal bunkers. The Engineer's office on the first floor opens on to a balcony giving a complete view of the machinery. The engine-room is 30 feet by 46 feet, and lofty in proportion; the extreme height being 40 feet. It contains three sets of direct-coupled compound engines, each of 135 indicated horse power, with dynamos, each of 85 kilowatt capacity and 500 to 550 volt pressure. There is also a balancing and charging set of 70 indicated horse, and 42 kilowatt power. The installation is equal to running 8500 lamps of 8-candle power simultaneously, or about 13,000 connected, with the balancer in reserve. The system adopted is the three-wire continuous current, with a voltage of 500 at the station and 250 to the consumers. The Consulting Engineer for the entire scheme was Mr. Albion T. Snell, of London. In declaring the works open, Lord Kelvin said he had never seen a prettier electricity supply station, and all the arrangements were perfectly up-to-date. At the luncheon in connection with the event, when the Mayor of Luton (Alderman L. Giddings) presided, Lord Kelvin responded to the toast of "Success to the Luton Electricity Works," proposed by the Mayor of St. Albans. In the evening there was a reception at the works, and the Mayoress switched on the current to the lamps in the streets.

The "Sheffield Independent" publishes periodically a chatty column on "Men and Things," written under the *nom de plume* of "Le Flaneur." Last week the author gave what he called a simple method of comparison of the cost of gas lighting and electric lighting, which has often puzzled people upon whom (as in Sheffield) the claims of the newer illuminant have been urged. It is generally admitted, he says, that electricity at 4d. per unit—the present price of a supply from the Corporation mains—is "not in it" with the Gas Company's gas at 2s. 2d. per 1000 cubic feet; but it is not a simple calculation that reduces these prices to common terms admitting a comparison. The first thing to bear in mind is that you are comparing "quantity of light." The "unit" of measurement of light, both for electric light and gas-light, is "candle power." The usual electric incandescent glow lamp is of 8 or of 16 candle power; and the Board of Trade "unit" of electric energy will maintain about 35 8-candle power lamps for one hour. In other words, you maintain a light equal to 35 × 8, or 280 candles, for one hour at a cost of 4d. On the other hand, the ordinary gas-jet, which burns about 5 cubic feet of gas per hour, gives about 3½ candles per foot of gas per hour. That is, with 5 feet of gas per hour, you maintain a light of 17½ candles; and 16 such lights would give you 280 candles for one hour, or exactly the same quantity of light which we have worked out to be the result of a "unit" of electricity costing 4d. But these 16 lights would only consume 80 cubic feet of gas per hour, and the cost of 80 feet of gas, with gas at 2s. 2d. per 1000, would only be a small fraction over 2d. Therefore, light for light, Sheffield gas is only half the price of Sheffield electric light. This calculation, of course, takes no account of the many superiorities of electricity over gas on the one hand; nor of the smaller cost of installing gas on the other hand. Neither does it allow for the increase of light obtained by incandescent gas lighting. The point to remember is that, as an illuminant, electricity at 4d. per unit is just twice as dear as gas at 2s. 2d. per 1000 cubic feet.

A long discussion took place at the last meeting of the Bedford Town Council as to the financial position of the electric light undertaking. The last published accounts are for the year ended March 31, and show an excess of expenditure over receipts of £2051, or equal to a 4d. rate. It is rather curious that in the statement of accounts for the year ended Dec. 31, 1900, the loss was put at £912. No satisfactory explanation was given of this difference. Mr. Baxter pointed out that in the six years of the installation's existence, about £80,000 of capital had been expended. Public lighting now cost £2000 more than in 1893; and it seemed to him that if the undertaking were controlled by a company, the shareholders would be greatly dissatisfied with the position. The Engineer (Mr. W. J. Hope Johnstone) frankly told the Council that they were charging too little for the current. Owing to the straggling nature of the supply, there was a loss on all the mains, except in High Street and two or three of the main streets. Mr. Lee Roberts pointed out that Tunbridge Wells had in six years made a profit of £6000, while Bedford had lost £5000 in the same time. As to the electric motor used for pumping sewage, it was stated in the debate that the undertaking charges 3d. per unit for this purpose, and receives from the rates £1327, whereas the total cost is £984; showing a "profit" of £343. Mr. Roberts described this as taking from Peter to pay Paul; it was only a profit made from the ratepayers' pockets. In the end, the report, giving comparisons between Bedford and other towns, was declared unsatisfactory, and the Electric Light Committee were asked to consider how the present burdensome loss could be turned into a profit. At the same meeting, Mr. Johnstone sent in his resignation. The Council recently offered him a fixed salary in lieu of the old arrangement, under which he was paid a small salary *plus* a commission on capital expenditure. This offer he declined. His notice takes effect in two months. A member of the Council suggested that the Electrical Engineer had been "hounded out of the town" by the criticisms of the undertaking. This was denied; and the Corporation passed unanimously a resolution expressing extreme regret at losing Mr. Johnstone's valuable services.

A definite step has lately been taken by the Elland District Council in the matter of the establishment of an electric light station combined with a refuse destructor. Messrs. Meldrum Bros. have obtained the contract for the latter, subject to the approval of the Local Government Board. The electric light scheme is estimated to cost £18,000; and its adoption was opposed by Mr. Spencer, on the grounds that the Council had not received any mandate from the ratepayers to carry out the work, and that the compulsory area to be supplied was an unfair one. He criticized the estimates of Mr. Emmott, of Halifax, who had prepared the scheme, and contended that incandescent gas, with which some of the shops in Elland are lighted, was considerably cheaper than electricity. He cited the case of one shop where the light was, he said, of 400-candle power, consuming 32 cubic feet of gas per hour, which, at 2s. 9d. per 1000 cubic feet, represented 1d. To have the same illuminating power with electricity, the shopkeeper would require 25 electric lamps of 16-candle power each. These would consume in one hour nearly two units of electricity, which, at 5d. per unit, would amount to about 9d. This was the comparative cost of electricity and gas, light for light—being at the rate of nine to one in favour of gas. He ventured to say the ratepayers of Elland would lose £500 per annum if they adopted electricity; and with the principal and interest on £18,000, this would increase their rates equal to about 1s. in the pound. He would not mind that, but they had really nothing in return for the great outlay; and, seeing that this was the case, he would certainly oppose the electricity scheme at present. He moved that the minutes of the Electricity Committee be referred back. The Chairman (Mr. Eastwood) seconded the proposition. He said he was not an opponent of the electric light for Elland, regarded as an illuminant; but, as custodians of the public purse, he claimed it was the Council's duty to proceed cautiously, and feel better satisfied than he himself did that the step they were taking was the right one. If they voted for the proposed expenditure, it meant that the indebtedness of Elland would increase from £22,000 to £43,000. Having criticized at some length the figures put forward in support of the scheme, he contended that to attempt to light Elland by electricity supplied from their own installation would end in financial failure. At the same time, if it was the wish of the majority of the Council to adopt the proposed scheme, he said he would endeavour to do his duty by sharing the responsibility. After some discussion, the scheme was adopted by a majority of three—the Chairman not voting.

CARLISLE CORPORATION WATER SUPPLY.

The Geltsdale Scheme Suspended.

At the Meeting of the Carlisle Corporation last Tuesday—the MAYOR (Mr. J. Hurst) in the chair—a long discussion took place on the subject of the difficulties which have arisen between the Geltsdale Water Committee, the Gas and Water Engineer (Mr. C. B. Newton), and the Consulting Engineer (Mr. E. M. Eaton), in connection with the carrying out of the new water scheme, to which reference has already been made in the "JOURNAL." As the result of events to which it is not now necessary to refer, the Committee, at their meeting on the 5th inst., passed, by a large majority, the following resolution: "That, in view of the present unsatisfactory position of affairs with regard to the Geltsdale water scheme, the small number of tenders, and the large discrepancy between them and the original estimate, the unsatisfactory explanations of the Engineers, together with the disclosure by Mr. Eaton of a compact between the Engineers and the Chairman (which Mr. Corbett denies) apparently to withhold or suppress information, and various other disquieting features, the Council be recommended to dispense with the services of the Engineer and Consulting Engineer, and, after the remaining notices to treat are served, the whole matter to remain in abeyance for twelve months, after which the best available advice be sought on the scheme." This resolution was brought up for consideration.

Mr. CORBETT (Chairman of the Committee) was called upon to move the confirmation of the resolution; but he suggested that it would be better to get the Mayor to do this, seeing that he (Mr. Corbett) did not agree with it, and was not present at the meeting.

The MAYOR said he was in the same position as Mr. Corbett. He did not agree with some of the assertions made.

Mr. WHITE, as the proposer of the resolution in Committee, said it would perhaps be wise if he undertook this duty. At the outset, he moved that two paragraphs in Mr. Newton's report of the 29th ult. be expunged, because they were not a correct record of what took place. He then went on to deal at some length with the subject-matter of the resolution. He stated that the Committee spoke therein of the unsatisfactory position of affairs with regard to the water scheme; but it would not be very far from the truth to suggest that "unsatisfactory" had been its normal condition ever since its inception. In its early stages, and before it had been launched on the Council and adopted, the Engineers had pulled together; but even before they got their Act of Parliament, it was a case of "pull devil, pull baker" with the two Engineers. The quarrel was patched up; but after they obtained their Act trouble again arose, owing to the difficulty the Committee experienced in getting information from the Engineer, while an arrangement had been made that all correspondence with the Consulting Engineer should go through him. He (Mr. White) had expected the Chairman's denial of any such arrangement; but that it existed was a palpable fact, because Mr. Eaton had told them where, and under what circumstances, it was made. In his opinion, they had been misled—whether wilfully or in ignorance, it was not for him to say. They were assured on May 4, 1897, that the formation of the surface at Castlecarrock was very favourable for the construction of a reservoir; and it was only on

June 7, 1901, when the large discrepancy of nearly £25,000 between the lowest tender and the original estimate had to be explained away, that they were told that the formation of the surface which was so favourable in 1897 contained 40,000 cubic yards of peat, which would have to be carted away. And that was not all, for they could not carry 40,000 cartloads of peat and throw it in some dyke back. They would have to buy a field to make a spoil bank for it. They were actually expected by the Engineers to believe that this peat had only been discovered lately. He was assured, on the very best authority, that it was found and reported on in 1896; and he left it to their imaginations what the possibilities might be when they began to remove that bog. The speaker went on to complain of the way in which the Corporation had been treated (he used a much stronger term) in connection with the purchases of land. He said it seemed to him that certain people thought the Corporation fair game to be plucked. Moreover, the proportions of the original scheme had been curtailed by the omission of two large filter-beds, 118 feet by 88 feet, and the reduction of the capacity of the service-reservoir at Cumwhinton from 6 to 5 million gallons, without any intimation being given of the alteration. Having cited other matters to justify the recommendation of the Committee, he concluded by expressing his want of confidence in Engineers who could lop off or tack on £10,000 or £20,000 just to suit the whim and caprice of the moment. The twelve months' rest which it was proposed to give the scheme would allow the present heat to subside. Personally, he hoped the Council would that day make an end of a long period of worry and anxiety, which had almost sickened him of public life.

Mr. DOVE, in seconding the motion, also complained of the manner in which the Committee had been kept in ignorance of various matters of importance, and said it could only have arisen from one of two sources—either inexperience or deliberate intention. He had loyally done his best to carry out the decisions of the Council; but instead of the Committee meetings being conducted on business lines, it had been one constant worry to drag out the information they wanted. The Committee must be the masters, supported by the Council; for if the officials were to dominate the Committee and the Council, the latter had better place the matter entirely in the hands of the Engineers, and let them carry it out themselves. The confidence of the public and the Committee had been so shaken by the causes already referred to, that he was afraid there was no other way out of the difficulty than that indicated in the resolution.

Mr. G. COULTHARD pointed out that from £130,000 the estimated cost of the scheme had gone up to £200,000. If this went on, the ultimate expense to the Corporation would be nearer £300,000 than £200,000. Therefore he, for one, would not consent to go to the extent of even £200,000 for the scheme. He thought the two Engineers had come a little too far north; and the sooner they were dispensed with, the better it would be for the Corporation and the citizens of Carlisle.

After some further discussion,

Mr. FRENCH said he was prepared to move, as an amendment, the omission of the words "together with the disclosure by Mr. Eaton of a compact between the Engineers and the Chairman (which Mr. Corbett denies) apparently to withhold or suppress information, and various other disquieting features."

Mr. WHITE: On behalf of the Committee, I will agree to that.

Mr. FRENCH said in that case he would support the resolution, as he thought it was the proper thing to do.

Mr. SAINT then moved, as an amendment, "That an independent Engineer be called in to report upon the whole scheme, including the quality and quantity of the water, for the supply of Carlisle, and in the meantime, until such report is received, the remainder of the notices to treat be served; and that Sir Frederick Bramwell be asked to make such report." He defended the Engineers from the attacks which had been made upon them, and said that, so far as he had seen, as a member of the Committee, the work had gone on satisfactorily up to the present time. The Council unanimously passed Mr. Newton's scheme for bringing water from the Gelt; and it was very amusing to notice how many people were now talking it down who then talked it up. How could these opinions have changed? Was it an excuse to get rid of Mr. Newton? With regard to Mr. Eaton, was he less able than he was? Had anything been proved against the scheme? [Mr. WHITE: Yes.] He said there was not. So far as he had seen, all the plans and specifications and quantities had gone through all right; but when they came to receive tenders, it was found that the lowest—£113,000—was £25,000 more than the original estimate. Of this £113,000 the Engineers now reported that there were "luxuries" amounting to £9600 that could be taken out without affecting the efficiency of the scheme, and this reduced the tender to £103,400, as against the £88,000 estimated by the Engineers originally. He contended that so far, their Engineers had done very well indeed, and said he was not afraid to still entrust the scheme to them, with the certainty that it would be carried out to the satisfaction of the Corporation. But as there had been so much misunderstanding, he was in favour of an independent engineer being called in, and he was sure both Mr. Newton and Mr. Eaton would stand by it.

Mr. TWEEDY seconded the amendment, and appealed to the Council to give the Engineers fair play.

Mr. JOHNSTONE and Mr. SCOTT having expressed their intention of supporting the Committee's recommendation,

Mr. COLLIN said he was one of the consistent members of the Council, for he had opposed this scheme from its inception until the present time. He should now support the resolution, for he wanted the twelve months' delay to be employed largely in satisfying the Corporation whether the scheme was good or bad. He held that it was a bad one, and therefore he should vote for the resolution. They had seen the difficulty the Committee had got into with the Engineers. It had been said that the blame rested largely with the Committee. The Committee was composed of the picked men of the Corporation, who had passed the Chair; and he could not put aside the judgment of such gentlemen, and support the insubordination of their official.

Mr. WHITE having replied,

The Council divided upon Mr. Saint's amendment, which was lost by 27 votes to 8. The resolution, in its amended form, was then put and carried without a division.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Alloa, thanks to the skilful management of Mr. A. Yuill, now possesses the distinction of having the cheapest gas in Scotland. The price was reduced by the Commissioners on Monday from 2s. 6d. to 2s. 4d. per 1000 cubic feet. There is more in the step than is at first apparent, because in Alloa a high illuminating power is supplied. The credit for being able to sell gas at so low a price is, therefore, all the greater. I understand it has taken Mr. Yuill several years to get his works into a condition which enables him to practise the economies that make the low price possible. He has now got his reward. Congratulations are being showered upon him locally; and he is thoroughly deserving of them all. At the meeting on Monday, Bailie Arrol, the Convener of the Committee, said that notwithstanding the reduction in the price, due provision had been made in the estimates to meet any emergency which might arise throughout the year. Provost Grant said the statement of accounts was entirely satisfactory. They had now the cheapest gas in Scotland; and for this they had, in a very great measure, to thank Mr. Yuill, their popular Gas Manager. The reduction is to be shared in by consumers outside the burgh.

The shareholders of the Newport Gas Company met on Thursday night, and unanimously agreed to accept the offer of the Town Council of £10,500 for the undertaking. The sale is, of course, subject to the adoption by the Municipality of the Burghs Gas Supply Acts; but there should be no difficulty about this, as both parties are agreed. Only an obstreperous ratepayer can now give trouble. This is one of the few transfers carried through without arbitration. The Town Council were advised by Mr. J. M'Gilchrist; the Company, by Mr. A. Yuill.

On Thursday, a Committee of the Dundee Corporation paid a visit of inspection to the new portion of the Corporation gas-works. The Engineer and Manager (Mr. W. M'Crae) conducted the party through the works, and explained the working of the different arrangements. There are about 500 retorts in the new portion, and 522 in the old works. Of the latter, only 240 are fired on the regenerative system. Hitherto all the coal has been dealt with by hand; now the new benches will be served with coal broken, elevated, conveyed, and stoked by mechanical appliances. There are four charging and four drawing Arrol-Foulis machines, driven by hydraulic power. Two Babcock and Wilcox boilers provide steam for working the machinery. The company were shown apparatus for intensifying gaslight, by the development of which system, it was explained, it is hoped that ere long Dundee will be lighted throughout by incandescent lamps. The Committee, before leaving the works, recorded their satisfaction with all they had seen.

The accounts of the Broughty Ferry Corporation Gas Department were before the Council on Monday, and were adopted. They showed the quantity of gas sold during the year to have been 56,590,308 cubic feet, which is a very good increase from 49,000,000 cubic feet in the previous year. The revenue from gas was £6825, from tar and ammoniacal liquor £480, and from coke £2237. The total revenue was £9614. On the expenditure side, coal cost £5355, and oil £496. The total expenditure was £10,874. There was thus brought out a deficit of £1259; but by applying £236 of the contingent fund derived from surplus revenue of previous years, the deficit has been reduced to £996. There was placed to sinking fund £787. The capital account amounts to £40,124. One of the items of expenditure is £872 for annuities for two years, which is explained by the payment of these having some time ago been allowed to fall into arrear for one year. Had it not been for this, the deficit would have been only £560. That there should have been a deficit is not surprising, as the gas supplied is a rich one, and the price was only 2s. 6d. per 1000 cubic feet. Benzol is used for enriching the gas in Broughty Ferry. Without it, the deficit would have been much greater than it has turned out to be.

The report of the Gas Committee of the Peterhead Town Council, submitted this week, was to the effect that they had contracted for coal at a price 4s. 6d. per ton less than last year, and that on the working of the past year there was a profit balance of £215. The Committee recommended that the price of gas be reduced by 7d., making it 3s. 8d. per 1000 cubic feet, with 2½ per cent. discount for cash in one month. Mr. Ritchie, the Convener, said he was glad to have again the pleasure of laying before them such a satisfactory account of the year's working. The revenue amounted to £5589, as compared with £4360 in the preceding year—an increase of £1229. The gas sold amounted to 24 million cubic feet, an increase of over 2 million cubic feet. The revenue from residuals was £1237. The expenditure was £4457, as compared with £3234, or an increase of £1123. Coal cost £2900, or an average of 22s. 1d. per ton, as compared with 18s. 3d. in the preceding year. The balance carried to net revenue account was £1231. Out of this and the previous balance, they placed £529 to sinking fund and paid £486 as interest, and had the net available balance of £214. A report like this was very gratifying indeed, and was beyond their expectations. In fact, had the balance been as much the other way, the Committee would not have been surprised, and would still have been able to congratulate themselves that they did not follow the example of all the other gas corporations (except two) in Scotland, by raising the price of gas to meet the enhanced cost of coal. Even if the present balance had been unfavourable to the extent it had been favourable, they would still have been able to have recommended a reduction in the price of gas, though, of course, not to the extent they now suggested. The whole result of the year's operations spoke very highly of the ability, energy, and clear foresight of their Manager (Mr. G. Keillor, jun.), who, he thought, deserved their thanks for his unstinted services and skilful management. Among other favourable features of the year, he was pleased to record the steadily increasing consumption of gas, brought about particularly by the extended use of cookers and heaters, which were now looked upon as one of the necessities of domestic life. They had 39 of these and 116 slot meters in use. The return from residual products was £729 more than in the preceding year, and amounted to 9s. 3d. per ton of coal carbonized. This was a striking proof of the success that had attended the installation of the sulphate and tar distillation plant, as well as of the great saving from the new retort-settings. It showed that their expenditure

upon these improvements, heavy though it was, had been amply justified, and had yielded them a very handsome return indeed. They estimated a surplus upon the current year's working of £1100. The reduction in the price of gas would absorb a little over £1000, but they would still have sufficient in hand to meet any adverse eventualities, and also probably to put the Committee in a position to recommend another reduction next year. Bailie Booth said that Mr. Keillor deserved their heartiest congratulations for that, the greatest of all his achievements since he went to Peterhead. He had brought the gas down to a price at which it had never been before in Peterhead. Treasurer Martin said there was no doubt that Mr. Keillor had proved himself a Manager of no ordinary sort; everything he had attempted having been an unqualified success. These very appreciative remarks must be highly gratifying to Mr. Keillor; but, of course, they are thoroughly deserved. Considering the disadvantages Peterhead labours under, gas at 3s. 8d. per 1000 cubic feet is something of which Mr. Keillor may be proud.

The Kirkcaldy Gas Company, Limited, had a profit on the past year's working of £4078, out of which the usual dividend has been paid, and £463 carried forward. A sum of £1430 was expended on capital account during the year. The Castle-Douglas Gas Company have paid a dividend at the rate of 7 per cent., the same as last year. The consumption of gas is increasing, owing to the number of gas cookers and heaters in use. The Leslie Gas Company have paid a dividend of 5 per cent. The Dunbar Gas Commissioners have fixed the price of gas for the current year at 4s. 7d. per 1000 cubic feet, the same as last year, though it is anticipated that at the end of the year there may be a small balance against them. The Wishaw Town Council have reduced the price of gas, as from April last, from 2s. 11d. to 2s. 5d. per 1000 cubic feet. The Jedburgh Gas Company held their annual meeting on Wednesday. A dividend of 5 per cent. was declared; and it was agreed to reduce the price of gas from 6s. 8d. to 6s. 3d. per 1000 cubic feet, as well as to make a reduction of 3d. extra per 1000 feet upon the price of gas consumed in cooking-stoves, and to all consumers of 50,000 cubic feet per quarter. The Cupar Gas Company, Limited, have paid a dividend at the rate of 5 per cent. on the preference stock, and at the rate of 30s. per share on the ordinary stock. It was intimated, at the meeting of shareholders on Thursday, that the Directors could not see their way to recommend a reduction in the charge for gas this year, because of the price of coal and the cost of improvements at the works; but they hoped to be able to make a reduction next year. The Burntisland Town Council have fixed the price of gas at 3s. 9d. per 1000 cubic feet, the same as at present. There was an increased consumption last year of 1½ million cubic feet, due to the introduction of gas-cookers. The Blairgowrie Gas Company have paid a dividend at the rate of 4½ per cent., as compared with 4 per cent. last year. The Kingskettle Gas Company have reduced the price of gas; it is now 5s. 10d. per 1000 cubic feet, and 5s. 5d. for gas consumed in cookers.

The Town Council of Aberdeen on Wednesday made their annual visit of inspection to the water-works above Banchory. At the banquet following the inspection, Mr. Bain, the Convener, in acknowledging the toast of the Water Committee, said that the water question was going to be a serious one; and it would be the means of imposing a large additional rate on the taxpayers of the city—in fact, he was inclined to think that, rather than pay the additional taxation, the citizens would drink dirty water out of the Dee or anywhere else. Some people believed that they had sufficient water in the Dee to provide a wholesome water supply for many years to come. It was his opinion that if the city continued to grow as it had been doing, they had only a sufficient water supply for ten years. He might, for the benefit of the new members, mention that the length of the aqueduct from Mannofield to Invercannie was 18 miles 3½ furlongs. The distance from Invercannie to the intake was about 1 mile. The water took took just twelve hours to go from Invercannie to Mannofield reservoir. They had seven reservoirs, holding in all 40 million gallons; and they had 125 miles of water-mains in connection with the supply. The total cost of the existing works up to date was £309,830. They had paid by means of the sinking fund £113,416; and the balance of debt still remaining was £196,413. Last year £9149 was paid off, and much more would be paid off yearly for the next nine or ten years, so as to clear off the whole cost of the present aqueduct and the works at Invercannie, in view of a new water supply being taken from some other source. At present they did no filtering worth the name; and they would have to consider whether they should take their new supply from a source that required filtering. He did not know what Mr. Hawksley would recommend; but from the experience he had had, he would strongly advise the Council not to adopt any method that required filtration.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *July* 13.

Sulphate of Ammonia.—There has again been a quiet but steady market. The quotations remain £10 5s. per ton f.o.b. Hull, and £10 10s. to £10 11s. 3d. per ton f.o.b. Leith and Liverpool. The demand has just been sufficient to remove current production; but there have been no special requirements to infuse new life into the market. The attention of buyers is still mainly directed to the forward position; but, as yet, they have scarcely made up their minds to advance to sellers' ideas of value. Makers quote £10 17s. 6d. per ton, ordinary terms, for July-December delivery; and it is reported that this price has been accepted for October-March. For January-June, 1902, delivery, £11 2s. 6d. per ton is quoted. The quotation, Beckton terms, London, for delivery up to the end of the year remains £10 15s. per ton.

Nitrate of Soda is quiet but firm, at 8s. 9d. to 9s. per cwt., according to quality.

LONDON, *July* 13.

Tar Products.—The markets remain steady; but there is not much business doing except in pitch, for which there is a good demand, though it is principally confined to London. In fact, most of the recent business

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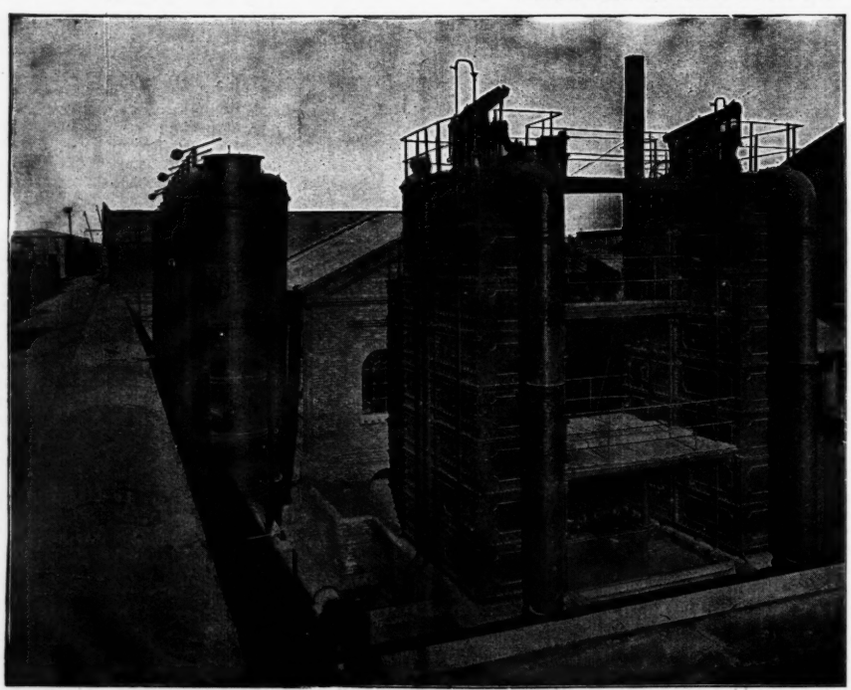
THE PURIFYING MACHINES REMOVE THE WHOLE OF THE AMMONIA AND TAR FROM THE CRUDE GAS TOGETHER WITH UPWARDS OF 50% OF THE CO_2 AND H_2S.



THE ANNULAR CONDENSER FITTED WITH WATER COOLING ARRANGEMENT COOLS DOWN THE GAS TO THE WATER TEMPERATURE IN THIS HOT CLIMATE.

WALKER'S PATENT CONDENSER AND PURIFYING-MACHINE AT SANTIAGO GAS-WORKS.

has been confined to Beckton make. Yorkshire makers are, however, still asking good prices, and appear indifferent as to selling for next season. Tar oils are not quite so firm. There is more offering in the Lancashire district, where some of the makers appear to hold large stocks. The depression in carbolic continues. Business has been done in London at 2s. 2½d. for August-October; but an offer of 2s. 2d. July-December was declined. The demand for benzol continues fairly good. There are buyers at 9d. f.o.b London; but makers, as a rule, ask 9½d. Some small transactions have taken place in Midland makes at fairly good prices. Solvent remains in the same depressed condition. There seems no business doing. Anthracene values are purely nominal; and there is no business transacting.

The average values obtaining during the week are: Tar, 14s. 6d. to 17s. 6d. Pitch, east coast, 30s. to 31s.; west coast, 28s. to 28s. 6d, Benzols, 90's, 8½d. to 9½d.; 50's, 8½d. to 9½d. Toluol, 10½d. to 11d. Crude naphtha, 4d. Solvent naphtha, 1s. to 1s. 1d. Heavy naphtha, 11d. to 1s. Creosote, 1⅛d. to 1⅝d. Heavy oils, 2⅛d. to 2¼d. Carbolic acid, 60's, 2s. 2d. to 2s. 2½d. Naphthalene, 60s. to 75s.; salts, 35s. to 42s. 6d. Anthracene, "A," 2½d.; "B," 2d. nominal.

Sulphate of Ammonia.—There is really nothing fresh to advise; but the demand is rather better at the close. The Gaslight and Coke Company are still in the same position, and do not seem disposed to reduce their quotation. If they were inclined to accept £10 10s. for September-December, no doubt they could do a fairly good business. Some small sales are reported at Hull at £10 6s. 3d. for good makes—in fact, in one instance as much as £10 7s. 6d. has been paid. The Leith market is reported as firmer; and as there is nothing pressing on the market, manufacturers are quoting £10 10s. Liverpool business appears fairly good. Makers ask £10 12s. 6d., and in some instances £10 15s.; but the quantities required for prompt shipment are decidedly small.

COAL TRADE REPORTS.

Lancashire Coal Trade.—There is no particularly new feature to report with respect to the gas coal trade, except that the relatively much lower prices at which collieries have found it necessary to tender for the locomotive fuel contracts are inducing one or two of the Lancashire collieries to compete rather for gas coal contracts than to accept any considerable quantities from the railway companies. As a result of this, one of the largest collieries in Lancashire, which is outside the Gas Coal Collieries Association, has gone in largely for gas coals in preference to contracting with the railway companies. The Associated Coalowners have generally held pretty closely to the understood reduction of 2s. 6d. on last year's prices for good screened gas coal. The colliery firm referred to have, however, tendered largely at a reduction of quite 3s., and have secured something approaching 100,000 tons in gas coal contracts. For good medium screened gas coals, the average basis price may be quoted as 10s. 6d. to 10s. 9d. per ton, as compared with 13s. 6d. to 14s.; and for best screened Wigan Arley gas coals, it is very exceptional where more than 11s. to 11s. 3d. per ton is being obtained, as against 14s. 6d. to 15s. last year. The special reduction of 3s. 6d. per ton upon unscreened gas coal, to which reference was previously made, brings the average prices for this class of fuel to about 10s. per ton at the pit; and it is more than probable some of the coalowners would be willing to tender at even under this figure. Further contracts for locomotive fuel coming upon the market have been competed for very keenly by Derbyshire colliery owners, who are reported to have taken about 8s. 3d. to 8s. 6d. per ton, which, however, Lancashire coalowners have declined in any way to entertain; but it would seem to have brought down Yorkshire collieries to 9s. per ton—further contracts having been placed there on this basis. Steam and forge coals are also now being contracted for pretty generally on the basis of about 9s. per ton at the pit, though one or two leading Manchester coalowners are holding to 10s. The shipping trade continues very slow, and prices are being cut for contracts; from 10s. 3d. to 10s. 6d. per ton being very common figures for forward delivery at the Mersey ports, with about 11s. to 11s. 3d. taken for good screened coals for prompt delivery. House-fire coals are still moving off slowly; but with pits working short time, there are no large accumulations of stock. List basis prices are being fairly well maintained at about 15s. per ton at the pit for best Wigan Arley, 13s. to 13s. 6d. for Pemberton four-feet and seconds Arley, and 11s. to 11s. 6d. for common house coal. Engine classes for fuel are not quite so plentiful on the market as of late, especially in the better sorts, and prices are a trifle steadier. From 8s. to 8s. 6d. per ton remain the average quotations for best Lancashire slack, and 6s. 6d. to 7s. for inferior sorts. Slack from other districts, however, competes at considerably under these figures, but not in such quantities as were coming forward a few weeks since. Coke is meeting with a fairly good inquiry, and is steady at late rates; good washed Lancashire furnace cokes averaging 12s. 6d. to 13s. per ton, with washed Yorkshire cokes now also quoted at about 12s. 6d., and common unwashed sorts at about 10s. at the ovens. Good foundry cokes remain at from 23s. to 24s. and 25s. per ton at the ovens, according to quality.

Northern Coal Trade.—There is a general activity in the coal trade, more especially in the best steam and gas branches of the industry. Best Northumbrian steam coals are steady at about 13s. per ton f.o.b.; while steam smalls are from 5s. to 5s. 3d., and are scarcely so brisk. In the gas coal trade, there is an active inquiry, and more local supplies have been arranged for, including those for South Shields. For occasional cargoes, the quotation for best Durham gas coals is from 10s. 6d. to 10s. 9d. per ton f.o.b.; while the contracts have been generally settled at from 8s. 10d. to 9s., or about the parity of that. Coke is steady at from 17s. to 18s. per ton f.o.b. Blast-furnace coke is about 15s. 3d. per ton at the furnaces; while gas coke—though in limited production—is still quoted at from 12s. to 13s. per ton f.o.b., with a shipment that is rather moderate in quantity.

Scotch Coal Trade.—The miners in the West are now on holiday, and meantime stocks are being worked off. Otherwise there is no variation in trade. The prices quoted are: Main 9s. to 9s. 3d. per ton

RICHMOND'S

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RICHMOND'S

f.o.b. Glasgow, ell 10s. 3d. to 11s. 3d., and splint 10s. to 10s. 3d. The shipments for the week amounted to 236,407 tons—an increase of 19,277 tons upon the preceding week, and of 11,031 tons upon the corresponding week. For the year to date, the total shipments have been 4,859,051 tons—a decrease of 636,888 tons upon the same period of last year.

THE SEASON'S GAS-COAL CONTRACTS.

The "Manchester Guardian" last week published an article by a "Trade Correspondent" on the contracts so far settled in the locomotive and gas-coal departments. He wrote that, in view of the general anticipations of a substantial downward movement in prices during the present summer, the basis upon which collieries would be able to renew their large contracts has been a matter of more than ordinary importance to both coalowners and consumers. In renewing gas-coal contracts, the Lancashire coalowners have been able to maintain their prices much better than in the case of locomotive fuel. The Associated Gas-Coal Collieries have, in fact, held pretty firmly to a minimum reduction of 2s. 6d. per ton on last year's prices for good screened qualities; but colliery owners, outside the Association, have given way 3s. per ton, and on unscreened gas coal there has been a reduction of 3s. 6d.—the object of this being to take as much slack off the market as possible, and thus keep up the price of engine-fuel. As a large proportion of the gas-coal contracts have now been decided, the basis prices may, he considers, be regarded as definitely settled. For unscreened gas coal, the average contract figure has been about 10s. to 10s. 3d. per ton at the pit, good medium screened coal 10s. 6d. to 10s. 9d., and best screened gas coal 11s. to 11s. 3d. Last year the average prices were on the basis of about 13s. 6d. to 14s. for medium, and 14s. 6d. to 15s. for the best gas coals at the pit. These prices compare very favourably with those that have had to be taken for locomotive fuel. In some instances coalowners have either declined to quote or have restricted the quantities they have offered to the railway companies, preferring to keep their output of common coal suitable for gas-making purposes free for tendering to the gas companies; and it is reported that one large colliery, while it has taken 4000 tons less in contracts for locomotive fuel, has secured more than double this quantity extra in contracts for gas coal. The downward movement in other descriptions of fuel has been somewhat irregular. Engine classes of fuel, which last year touched an abnormal figure quite out of proportion to their relative value compared with other classes of fuel—the minimum for common slack being 10s. 6d., with best qualities fetching 11s. to 11s. 6d. at the pit—have shown a very considerable downward movement on these figures during the present year, until the common Lancashire slacks do not average more than about 6s. 6d. to 7s., and the best sorts 8s. to 8s. 3d.—anything above this only being got in very special cases. For the moment, there is perhaps a steadying of the downward movement of slack, owing to the restricted output; but competing supplies coming in from other districts keep prices low.

Water Shortage at Blyth.—The dry weather has had a serious effect at Blyth. Owing to the drought, the water service of the Cowpen District Council, which supplies a population of more than 17,000 people, failed on Monday last week, and the district experienced all the disadvantages of a famine.

Portishead Water Company's New Works.—A new pumping-station for the Portishead Water Company was formally opened last Wednesday. The well is 103 feet deep; and the power for pumping the water is supplied by a Campbell oil-engine, of 40 brake horse-power. A covered concrete service reservoir, capable of holding 154,000 gallons, is being constructed in close proximity to the old reservoir.

Water Supply by Meter.—We learn from the "Engineering Record" that all new water-service pipes in Bay City (Mich.) where the assessment rate exceeds the minimum meter rate, and where the fittings are of such a nature as to render probable a considerable waste of water, are now metered when they are put in. Mr. E. L. Dunbar, the Superintendent of the works, states that a few meters are attached to old services each year, but there are many old connections where there is waste, which it would be economical to meter—a fact indicated by the high consumption per head, which is 112 gallons daily for a city of 28,000 people.

Swansea Reservoir Contract.—Reference has on previous occasions been made to the dispute which has arisen between the Swansea Corporation and Messrs. John Paterson and Son, Limited, the Contractors for the new reservoir at Cray. It may be remembered that litigation has been pending for some time, but was recently abruptly terminated by the Contractors offering to accept a certain sum, and the Mayor and Town Clerk, on behalf of the Corporation, agreed to pay £26,000, which includes the value of the material on the works, £2500 money on deposit, and £1500 certified for. The work has been in hand for three years; the original contract price being £254,000. The agreement was considered at a private meeting of the Water and Sewers Committee of the Corporation last Tuesday, at the close of which the Town Clerk explained to the representatives of the Press the circumstances under which it had been arrived at. He stated that on the 25th of June, when the objections of the Contractors to the action of the Corporation in determining the contract were to have been heard by a Judge in Chambers, terms were arranged whereby the Messrs. Paterson were to receive £26,000. This was, however, but a tentative arrangement, made to enable them to submit a definite offer to that effect within the following week. During that time they proposed to settle for £35,000, or £9000 more than the suggested price. The Corporation then decided to fight; but on Friday, the 5th inst., at what was virtually the last moment, the Contractors accepted the £26,000. The settlement was then reported to the Judge, and the whole matter closed. The Town Clerk added that the town had full value for every penny of the £26,000 in the shape of plant, material, and money held. The Corporation have entered into possession, and, we understand, work is being proceeded with under the direction of the Borough and Water Engineer, Mr. R. H. Wyrill.

CARBURETTED WATER-GAS APPARATUS

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BLACKBURN	1,250,000	WINNIPEG, MAN.	500,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	COLCHESTER (Second Contract)	300,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	YORK	750,000
COLCHESTER	300,000	ROCHESTER	500,000
BIRKENHEAD	2,250,000	KINGSTON, ONT.	300,000
SWINDON (New Swindon Gas Co.)	120,000	CRYSTAL PALACE DISTRICT	2,000,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	DULUTH, MINN.	300,000
WINDSOR ST., BIRMINGHAM (Second Cont.)	2,000,000	CATERHAM	150,000
HALIFAX	1,000,000	LEICESTER	2,000,000
TORONTO	250,000	ENSCHEDE (HOLLAND)	150,000
OTTAWA	250,000	BUENOS AYRES (RIVER PLATE CO.)	700,000
LINDSAY (Remodelled)	125,000	BURNLEY	1,500,000
MONTREAL	500,000	KINGSTON-ON-THAMES	1,750,000
TORONTO (Second Contract; Remodelled)	2,000,000	ACCRINGTON	500,000
BELLEVILLE	250,000	TONBRIDGE	300,000
OTTAWA (Second Contract)	250,000	STRETFORD	500,000
BRANTFORD (Remodelled)	200,000	OLDBURY	300,000
ST. CATHERINES (Remodelled)	250,000	TODMORDEN	500,000
KINGSTON, PA.	125,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
PETERBOROUGH, ONT.	250,000	YORK (Second Contract)	750,000
WILKESBARRE, PA.	750,000	ROCHESTER (Second Contract)	500,000
ST. CATHERINES (Second Contract)	250,000	NEWPORT (MON.)	250,000
BUFFALO, N.Y.	2,000,000	TOKIO, JAPAN	1,000,000

Complete Gas-Works at NELSON, BRITISH COLUMBIA.

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Cork Striker Fined for Assault.—At the Cork Police Court, a few days ago, John Buckley, formerly in the service of the Cork Gas Company, was fined 20s., and 10s. costs, for assaulting a man named James Murphy, one of the hands who have taken the places of the men on strike. An attempt was made to show that the case was one of mistaken identity; but the Magistrates expressed their entire satisfaction with the evidence against the accused.

Finedon Gas-Works Extensions.—The Directors of the Finedon Gas Company have decided to effect considerable improvements at their works. A new retort-house is being erected, and an order has been placed with Messrs. Jonas Drake and Son for the iron roof, steel foul-main, and a new retort-stack, with regenerator furnaces. New offices, show-room, board room, &c., are also to be provided. The plans and specifications for these extensions have been prepared by Mr. A. T. Harris, of Market Harborough, under whose supervision the work is being carried out.

Glastonbury Gas-Works Transfer.—The Glastonbury Gas-Works were formally transferred to the Corporation on the 1st inst. Mr. W. A. Valon, who had been advising the Gas Company, was retained by the Corporation as Consulting Engineer; and the matter of stocks was adjusted by him for both parties—the Corporation agreeing to pay 4 per cent. on any part of the purchase-money left unpaid from the above-named date. This, however, will be only a small matter, as it was arranged that a cheque in full discharge would be paid by the Corporation to the Company during the past week.

Newtown Gas-Works Purchase.—In the paragraph on this subject which appeared last week (p. 110), the value of the stocks claimed by the Gas Company should have been given as £409 16s. 3d. The Council's adviser (Mr. W. A. Valon), as then stated, valued the stock-in-trade at £220. To this, however, £45 had to be added for tar, coke, gas, &c.; making his total valuation £265; while the Company claimed £454 16s. 3d. On the day of the transfer (the 1st inst.), the Company offered to accept Mr. Valon's valuation *plus* £35; in other words, to take £300 for their claim. As all matters since the arbitration had been settled without dispute, he recommended the Committee of the Council to concede this; and the works thereupon changed owners.

Matlock Bath Gas Supply.—At the meeting of the Matlock Bath District Council last Tuesday, the General Purposes Committee, who had had before them the recent discussion at the Matlock Urban District Council over the proposal to remove the Matlock Bath Gas-Works, and the petition of the ratepayers of Starkholmes for the provisions of the Act to be enforced (*ante*, p. 102), reported that they had resolved to write again to Mr. F. C. Arkwright, asking for the sale to them of a suitable site between the Midland Railway and the Canal, in the Cromford meadows. The report on the gas undertaking included the annual statement, from which it appeared that there had been made a profit on the gas-works of £1001 18s. 7d., against £938 in the previous year; the past twelve months having been the most profitable in the Council's experience since they bought the undertaking. The report was adopted. The price of gas for cookers was fixed at 3s. 5d. per 1000 cubic feet.

Labour Trouble at the Llanelly Gas-Works.—Owing to a dispute at the Llanelly Gas-Works, two men were recently dismissed, with the result that the other men handed in their notices. The discharged men were afterwards reinstated, and their companions' notices withdrawn.

Coventry Water Supply.—The income of the Coventry Water Department for the past year was £16,024; the expenses were £10,675; and the profit was £5349. The Water Committee recommended that £3000 of this should be paid into the borough fund in aid of the next two borough rates, in equal moieties. At the last meeting of the City Council this was agreed to.

Aspatria Water Scheme.—The Provisional Committee under the Aspatria, Silloth, and District Water Act, are making exertions with a view to the completion of the scheme (estimated to cost £30,000) by next summer. Mr. Williamson, of Allonby, has been invited to become Chairman of the Water Board; and the Local Government Board are being pressed to fix an early date for the first meeting, so that the work can be started before the coming winter. Mr. F. Richardson, of Aspatria, the Secretary, has been authorized to obtain loans of not less than £100. It is proposed to collect the water of the upper reaches of the River Ellen and Lake Overwater in a huge reservoir, and convey it by gravitation to the Aspatria and Silloth districts.

Cost of the Newport (Mon.) Water Scheme.—At last Tuesday's meeting of the Newport County Council, Mr. Williams, referring to a paragraph in the Water Committee's report which stated that the amount already expended upon the Wentwood water scheme was £264,276, urged that the time had arrived when the long-promised estimate as to the cost of the works should be presented to the Council. When he joined the Council some six years ago, he said the estimate for the works was £90,000 to £100,000; while a member of the Committee had suggested that the cost would be £500,000. It was stated that Mr. Baldwin Latham was preparing such an estimate as was asked for; and that it would have to be presented to Parliament when the Corporation Bill was deposited in the coming session.

Water Supply Difficulties at Winshill.—At the monthly meeting of the Burton-upon-Trent Town Council last Wednesday, the subject of the water supply of Winshill, to which reference was made in the "JOURNAL" last week (p. 109), was mentioned. There was a recommendation in the report of the Health Committee for the prosecution of certain persons in Winshill for obstructing the workmen of the South Staffordshire Water Company in the laying on of water to the houses; but it was pointed out that the people were practically waterless, and that what little they had been able to get was very dirty. The complaints on this head were numerous; the Mayor (Mr. Morris) himself saying he had made a personal examination of the houses, and could confirm what had been stated. It was decided to defer the portion of the report relating to the matter. Alderman Parker, the Chairman of the Committee, said the Council would never have been so unbusinesslike as to force the people to take the Company's water if the latter had not guaranteed a proper supply; and the Committee would do their best to make the Company aware of their responsibility.

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Reductions in Price.—The Harrow and Stanmore Gas Company notify that the price of gas will be reduced, as from the taking of the indices at the Midsummer quarter, by 3d. per 1000 cubic feet throughout the whole of their district. The Burton-on-Trent Corporation have reduced the price 3d. per 1000 cubic feet. The Directors of the Eckington Gas Company have reduced the price of gas from 4s. 4d. to 4s. per 1000 cubic feet from the 1st inst. The Luton Gas Company announce that, owing to the reduction in the cost of coal, the price of gas will be lowered to 2s. 6d. per 1000 cubic feet; being 3d. less than the present charge.

Increased Storage at the Rushden and Higham Ferrers Gas-Works.—The storage accommodation at the above-named works has lately been increased by the erection of a telescopic holder, in two lifts, 100 and 102 feet in diameter respectively, each 30 feet deep; and it was formally brought into use by the Chairman of the Company (Mr. E. B. Randall) turning on the supply of gas to the town, in the presence of the Board, on the 7th ult. The plans and specifications were prepared by the Company's Engineer and Manager (Mr. T. Watson); the contractors for the holder were Messrs. C. & W. Walker, Limited; and the brick tank was constructed by Mr. W. G. Wilmott, a local builder. At the meeting of the Directors on the 5th inst., they passed a resolution expressing their appreciation of the services rendered by Mr. Watson in connection with the holder, and they said, congratulating him upon the very successful completion of the work, which bore evidences of great engineering skill. The Chairman was requested to convey the thanks of the Directors to Mr. Watson. The resolution was entered upon the minutes; and Mr. Watson's salary was increased by £100 per annum, as from the 30th ult.

The Divining-Rod Again.—Some experiments with the divining-rod have just been carried out at Etwall, Derbyshire. The Repton Rural District Council have fixed upon a site at the village named for an isolation hospital, and the services of a diviner were requisitioned for locating the water supply. The experiments took place in the presence of a large number of people. The diviner employed the usual forked twig of hazelwood, which he carried before him. When water was approached, the rod turned; but later it was twisted completely over. On the precise spot where this occurred, a spring 35 feet deep, and capable of yielding from 25,000 to 30,000 gallons of water a day, was discovered. It is stated that several streams of surface water were found, which had comparatively little effect on the twig. Several of the company tried their skill with the rod, but without result. Referring to this matter, Dr. Barwise, the Medical Officer of Health for Derbyshire, has published the following statement: "I see that a water diviner has discovered that a good supply of water can be obtained at a depth of 36 feet on the site of the Etwall Hospital, near Burton. As I had to approve the site of this hospital, and should not have done so without there was an ample water supply, I think it is only right to say that a supply of water could be obtained by sinking a well at any point on the site; so that the water diviner's services were quite unnecessary. Any point in the field would give as good a supply as the one which has been selected.

Bedford Water Supply.—An important scheme of water supply for Bedford is being prepared by Mr. G. F. Deacon, who has been engaged by the Corporation to consider the best means of improving and extending the present sources. In his report, he says the water is liable to pollution, and that of the most serious kind; while the quantity is manifestly insufficient, as a constant supply is not given. He believes that the Ouse water, if filtered through sand in the best known manner, would be very much safer than the water at present supplied to Bedford, though the amount of organic impurity would be greater. He suggests having recourse to the lower greensand formation in North Bedfordshire, which would furnish an ample and pure supply. The works necessary for providing 2½ million gallons a day would cost £66,000. The Town Council have decided to adopt Mr. Deacon's suggestion, and have instructed him to sink boreholes.

Parliamentary Expenses.—At the meeting of the Morecambe District Council yesterday week, the Gas Committee reported that the Clerk had produced the certificate of the Taxing Master of the House of Commons of the costs and expenses of Messrs. Hargreaves and Co. and Messrs. Clark, Oglethorpe, and Sons, Solicitors of the Morecambe Gas Company, including their out-of-pocket expenses and payments to engineers, witnesses, &c., amounting to £1105 8s. 7d. Also the certificate of taxation of the costs of Messrs. Lewin, Gregory, and Anderson, Parliamentary Agents, and Mr. Tilly, Solicitor, including their out-of-pocket expenses and payments to engineers, witnesses, and deputations, amounting to £2183 4s. 3d. Later in the proceedings, Mr. Birkett asked if the bills for the law costs of the transfer of the gas undertaking, which were before them were final, or were they going on everlastingly. Mr. Willis: No; we have not got them all in yet. Mr. Snowden: Can Mr. Willis give us the total expenses of this gas case? Mr. Willis: There was a sum of £5000 allowed for the expenses of the Bill; and out of that something like £3000 has been expended. He added that it would take all the £5000.

Tees Valley Water Board Finances.—The accounts of the Tees Valley Water Board for the half year ending Feb. 14, which have lately been issued, show that the capital expenditure for that period was £6446 12s. 11d.; bringing up the total cost of the undertaking to £1,912,460 10s. 8d. A sum of £15,692 was received on capital account; the total amount to date being £1,916,774, or £4313 more than the amount expended. The revenue account shows the income to have been £48,059; being an increase of £1041 compared with the preceding half year, and of £1811 compared with the six months ending Feb. 14, 1900. The expenditure on revenue account amounted to £8937. The balance carried to the net revenue account is £39,122, compared with £38,326 in the previous six months, and £37,885 in the half year ending Feb. 14, 1900. The net revenue account is debited with several payments for interest, and is credited with the interest allowed by the bank. After being dealt with in this manner, there remains a balance of £59,364 including the sum of £20,424 brought forward. Of this amount, £36,000 was paid to the Corporations during the half year; leaving £23,364 to be carried forward, £21,000 of which has since been paid to the Corporations.

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Mr. J. H. Brearley, of Longwood, has been appointed Consulting Gas Engineer to the Meltham Town Council for twelve months, for which period he will have full charge of their gas-works.

For the completion of a reservoir which was commenced four years ago, the Winsford District Council have asked the Local Government Board to sanction the borrowing of an additional £1500. The original contract was for £4400. Owing to a dispute between the Engineer and the Contractor, the work was left standing, with disastrous results.

At a special meeting of the Leicester Town Council held on Monday last week, a resolution was passed authorizing the creation, under the powers of the Leicester Corporation Act, 1884, and the Provisional Orders amending it, of £335,000 of Leicester Corporation 3 per cent. redeemable stock, of which £13,111 17s. 6d. is required for gas-works, and £97,689 for electric lighting purposes.

As will be seen by an announcement which appears elsewhere, the Southwark and Vauxhall Water Company notify a further issue of their 3 per cent. debenture stock redeemable at par 25 years from the date of issue. This is the third largest of the Metropolitan Water Companies, and supplies an area having a population exceeding 800,000. The gross revenue from water-rents, &c., for the year ended March last was £286,283, against £213,581 ten years previously.

Through the kindness of the Directors of Meters Limited, the joint staffs of Messrs. J. & J. Braddock, George Orme and Co., and Sawer and Purves held their first picnic on Saturday, the 6th inst.—Worksop being the place selected. On their arrival, they partook of luncheon at the Lion Hotel, and afterwards drove through the Dukeries and Sherwood Forest; returning to the hotel at five o'clock for dinner. A vote of thanks to the Directors was passed, and was responded to by Mr. Nasmith, the Managing-Director.

Messrs. Jonas Drake and Son have just received an order from the Birmingham Corporation for a duplicate coal-breaking, elevating, and conveying plant at their Saltley Gas-Works.

Messrs. C. & W. Walker, Limited, of Donnington, Salop, have just received orders for the supply and erection of a gasholder 140 feet in diameter, with steel tank, and foundations complete, for the Bedford Gas Company; also for a telescopic gasholder 103 feet in diameter and steel tank for the Prague station of the Imperial Continental Gas Association. The firm have likewise in hand a large holder and steel tank for the Potteries station of the British Gaslight Company, and one 185 feet in diameter for the Southampton Gas Company.

Mr. F. L. Ramsden, the Gas and Electric Light Engineer of the Burton-upon-Trent Corporation, has been granted an increase of £50 per annum in his salary. In bringing the matter forward at the meeting of the Town Council last Wednesday, Mr. Lowe, the Chairman of the Gas and Electric Light Committee, referred to the new coal contracts, and explained that the price was 3s. 2d. a ton less than was paid last year. He said this was due to a great extent to the exertions of Mr. Ramsden (who, it appears, advised postponing the contracts for a time), and would result in a saving of nearly £1200 on the purchases for the year.

Cardboard discs are employed instead of pennies, by certain parties at Burton-on-Trent, for procuring a supply of gas from penny-in-the-slot meters. In one meter no fewer than 45 of these discs were found. The Finance Committee of the Corporation dealt very leniently with the offender—simply ordering him to pay the 3s. 9d.; but any future case of the kind, which really amounts to a fraud, is to be severely dealt with. When this announcement was made at the Town Council meeting last Wednesday, a councillor asked whether, in case a person did not happen to have a penny, he would be allowed to put in a card disc, and pay when the collector opened the meter. The Mayor replied: Certainly not.

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City Chambers, Glasgow,
July 6, 1901.

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THE Directors invite Offers for the surplus TAR made at their Brierley Hill and Kingswinford Works, to be taken between Aug. 1 next and June 30, 1902, delivered into Buyers' Boats.
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Tenders to be addressed to the Chairman, endorsed "Tender for Surplus Tar," not later than the 20th inst.
HENRY M. JACKSON,
Secretary.
Board Room, Gas-Works,
Brierley Hill, July 8, 1901.

BRIERLEY HILL DISTRICT GASLIGHT COMPANY.
TENDERS FOR COAL.
THE Directors are prepared to receive TENDERS for the supply of 6000 Tons of GAS COAL, delivered to Brettell Lane or Round Oak Siding (G.W.R.), in such quantities as may be required, from the 1st of August next, to the 30th of June, 1902.
Tenders, stating price per Ton (20 cwt.), delivered to the above-mentioned Stations, with latest Analytical Tests, to be sent addressed to the Chairman of the Company, and marked "Tender for Coal," not later than the 20th inst.
The Directors reserve the right to accept Tenders for the whole or any portion of any quantity offered, and do not bind themselves to accept the lowest or any Tender.
No Tender Forms issued.
By order,
HENRY M. JACKSON,
Secretary.
Board Room, Gas-Works,
Brierley Hill, July 8, 1901.

COLWYN BAY AND DISTRICT GAS COMPANY.
THE Directors invite Tenders for the supply of about 3500 Tons of best screened GAS COAL, to be delivered, carriage free, at Colwyn Bay Station, between Aug. 1, 1901, and June 30, 1902, in such quantities per week as may be desired.
Forms of Tender not supplied.
Tenders, endorsed "Coal," to be sent to the Chairman of the Gas Company, Wm. Earp, Esq., not later than Monday, July 22.
J. C. PENNINGTON,
Engineer and Manager.

WAKEFIELD GASLIGHT COMPANY.
TENDERS FOR GAS COALS.
THE Directors of the above Company invite TENDERS for GAS COALS for the period ending June 30, 1902.
Forms of Tender and further Particulars can be obtained from the undersigned, to whom Tenders, addressed to the Chairman and endorsed "Tender for Gas Coal," must be sent on or before Saturday, July 27, 1901.
H. TOWNSEND,
Engineer and Manager.
Gas-Works, Wakefield,
July 10, 1901.

BOROUGH OF BURTON-UPON-TRENT.
GAS-WORKS.
NEW BOILERS.
CONTRACT No. 23.
THE Corporation of Burton-upon-Trent invite TENDERS from competent persons for the supply, construction, and erection of Two STEEL CORNISH BOILERS at the Gas-Works in the said Borough.
Full Particulars and Copies of Conditions and Specification, with Form of Tender, may be obtained on application to the undersigned.
Sealed Tenders, endorsed "Boilers," are to be delivered to me at or before Ten a.m., on Wednesday, the 31st day of July inst.
The Corporation do not bind themselves to accept the lowest or any Tender, nor will they pay any expense or charge relating to the making or delivery of the same.
No Tender will be accepted from any party who pays to his or their employees, whether Artisans or Labourers, less than the Standard Rate of Wages paid in this Borough, or who does not conform to the Hours and Conditions of Labour generally recognized in each branch of industry affected, and clauses to ensure compliance with this Regulation are inserted in the conditions of Contract.
F. L. RAMSDEN,
Manager and Engineer.
The Gas and Electric Light Works,
Burton-upon-Trent, July 10, 1901.

BENZOL WANTED.

THE Holywood Gas Company, Limited, County Down, invite TENDERS for 500 to 1000 Gallons purified 90 per cent. BENZOL, delivered at their Works in such quantities as may be required between the months of September, 1901, and March, 1902, in perfectly tight Drums containing 40 to 80 gallons each.

ST. ANNE'S-ON-THE-SEA GAS COMPANY.

THE Directors invite Tenders for the supply of 4000 Tons of best screened GAS COAL, to be delivered as required during the period from Aug. 1, 1901, to June 30, 1902.

Tenders, endorsed "Coal," to be sent to the undersigned not later than the 20th inst.

WILLIAM H. NUTTER,
Secretary and Manager.

Gas Offices, St. Anne's-on-the-Sea,
July 4, 1901.

HINCKLEY URBAN DISTRICT COUNCIL.

THE Gas Committee invite Tenders for the supply of COAL, LIME, and SULPHURIC ACID; also for the purchase of TAR.

Full Particulars and Form of Tender may be obtained from Mr. Fred Lee, Gas Manager.

Endorsed Tenders to be sent to me not later than Saturday, July 20, 1901.

A. S. ATKINS,
Clerk.

Hinckley, July 5, 1901.

GAS COKE.

THE Gas Committee of the Stoke-upon-Trent Corporation invite TENDERS for their surplus COKE (Estimated Quantity 4000 to 5000 Tons) over the period extending to the 30th of June, 1902.

Delivery can be made by Canal or North Stafford Railway (Pratts Sidings).

Sealed Tenders, to be endorsed "Coke," and sent in not later than noon, July 18, 1901, addressed to the Chairman, F. Geen, Esq., J.P., Gas Offices, Wharf Street, Stoke-upon-Trent.

WM. PRINCE,
Engineer and Manager.

TENDERS FOR COAL AND CANNEL.

THE Directors of the Sheffield United Gaslight Company invite TENDERS for GAS COAL, NUTS, and CANNEL, for delivery during the period ending the 30th of June, 1902; the Tenders to state whether the coal is Screened or Unscreened.

Tenders (Forms for which can be obtained on application) must be delivered to the undersigned not later than the first post on Thursday, the 25th inst.

The Directors reserve the right to take the whole or any portion of the quantity offered, and do not bind themselves to accept the lowest or any Tender.

HANBURY THOMAS,
General Manager and Secretary.

Commercial Street, Sheffield,
July 10, 1901.

TYLDESLEY-WITH-SHAKERLEY URBAN DISTRICT COUNCIL.

THIS Council invite Tenders for the supply and erection at the Gas-Works, Tyldesley, of one STEEL TANK for GASHOLDER.

Further Particulars as to same may be had on application to the Engineer, Gas-Works, Tyldesley.

Tenders (on authorized forms only, which will be supplied by the Gas Engineer on application), sealed, and endorsed "Tender for Steel Tank," to be addressed to the undersigned, and delivered at the Council Offices, Tyldesley, not later than the 12th of August next.

The Council do not bind themselves to accept the lowest or any Tender.

By order,
WM. J. MATTHEWS,
Clerk.

Council Offices, Tyldesley,
July 10, 1901.

BOROUGH OF CONGLETON.

TENDERS FOR GAS COAL.

THE Gas Committee of the above Cor-poration invite TENDERS for the supply of 4000 Tons of best screened GAS COAL, or Washed NUTS, or BURGY, and 250 Tons of best screened CANNEL or CANNEL NUTS, to be delivered during the next Twelve Months.

Forms of Tender are not supplied.

Sealed and endorsed Tenders, addressed to the Chairman of the Gas Committee, to be delivered at the Town Clerk's Office, not later than Monday, the 22nd of July current.

WM. ORME,
Manager.

Gas-Works, Congleton,
July 1, 1901.

CORPORATION OF CLONMEL.
(GAS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Gas Committee of the above-named Corporation are prepared to receive TENDERS for the supply of DURHAM or any other good GAS COAL free from Sulphur, Bats, Bind, Refuse and Dirt, for One, Two, or Three Years respectively, from the 30th of June, 1901. The estimated Yearly Consumption is about 3000 Tons.

Coal to be delivered as required in Waterford by sailing ships, which will be discharged at the rate of 30 Tons per working day.

The Committee reserve the right to accept Tenders for the whole or any portion of the quantity offered, and do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, endorsed "Tender for Gas Coal," to be delivered on or before the 21st of July, 1901, addressed to the Secretary, Gas-Works, Clonmel.

Gas Offices, Clonmel,
June 26, 1901.

THE Directors of the Tewkesbury Gas Company, Limited, are open to receive TENDERS for the whole or part of 1500 Tons of best screened GAS COAL, delivered free on rails, at Tewkesbury Station as required, during Twelve Months ending the 31st of July, 1902.

Sealed Tenders to be addressed to the undersigned on or before the 31st inst.

The Directors do not bind themselves to accept the lowest or any Tender.

RALPH CHANDLER,
Secretary.

Gas Offices, Tewkesbury,
July 15, 1901.

THE Middleton Corporation have for SALE a quantity of Best Forked GAS COKE. They are prepared to receive TENDERS for the purchase of 1000 Tons or any portion thereof, which Tenders must be addressed to the Chairman of the Gas, &c., Committee, endorsed "Tender for Coke," and delivered at my Office on or before the 20th of July, 1901.

Any further Particulars can be obtained from Mr. T. Duxbury, Gas Engineer.

The Corporation do not bind themselves to accept the highest or any Tender.

FREDERICK ENTWISTLE,
Town Clerk.

Town Hall, Middleton,
Near Manchester, July 12, 1901.

THE GASLIGHT AND COKE COMPANY.

TENDERS FOR COKE.

THE Directors of this Company are prepared to receive TENDERS for the purchase of COKE, to be supplied into Ships (for export), Barges or Railway Trucks, at their Beckton Station, and into Barges at their Bromley-by-Bow and Nine Elms Stations, within the Twelve Months commencing on the 1st of October next.

Particulars and Forms of Tender can be obtained upon application at this Office.

Tenders to be sent in so as to be received here not later than Twelve o'clock (noon) on Wednesday, the 24th inst., addressed to me, and endorsed "Tender for Coke."

The Directors do not bind themselves to accept the highest or any Tender.

By order,
JOHN WILLIAM FIELD,
Secretary and General Manager.

Chief Office: Horseferry Road,
Westminster, S.W., July 12, 1901.

BOROUGH OF DEWSBURY.

THE Lighting and Water Committee of the above Corporation invite TENDERS for the supply and delivery during the period ending July 31, 1902.

1. SULPHURIC ACID.
2. WET and DRY GAS-METERS.
3. CAST-IRON GAS and WATER PIPES.

Specification and Forms of Tender may be obtained on application to the Gas Engineer, Mr. Chas. A. Craven, Gas-Works, Savile Town, Dewsbury.

Tenders, under sealed covers, endorsed "Sulphuric Acid," "Meters," or "Cast-Iron Pipes" as the case may be, to be sent to me not later than Saturday, the 27th day of July, 1901.

The Corporation do not bind themselves to accept the lowest or any Tender.

By order,
G. TREVELYAN LEE,
Town Clerk.

Town Hall, Dewsbury.

THE Directors of the Kingston-upon-Thames Gas Company invite TENDERS for the supply of 15,000 Tons of best DURHAM or other good GAS COAL, to be delivered in Barges at the Free Wharf, Kingston-upon-Thames, deliveries as required at the rate of about 40 per cent. during the Six Summer Months, and 60 per cent. during the Six Winter Months, between the 1st of August, 1901, and the 31st of July, 1902.

Also 5000 Tons of BARROW or other good screened SILKSTONE GAS COAL, delivered in Trucks at the Company's Siding. Time of delivery and quantities as above stated.

Tenders to be sent in on or before the 24th inst., addressed to the Chairman of the Directors, and endorsed "Tender for Coal."

Any further Information may be obtained of the undersigned.

The Directors do not bind themselves to accept the lowest or any Tender.

H. F. PACKHAM,
Engineer and Manager.

Gas-Works, Kingston-upon-Thames,
July 12, 1901.

BOROUGH OF BRIGHOUSE.

TENDERS FOR GAS COAL, NUTS, CANNEL, AND LIME.

THE Gas Committee are prepared to re-ceive TENDERS for the supply and delivery of GAS COAL and CANNEL and BUXTON LIME required at the Mill Lane and Birds Royd Gas-Works during the Year ending the 30th of June, 1902.

Specification and Form of Tender can be obtained on application at the Gas Engineer's Office, Mill Lane, Brighouse.

Sealed Tenders, stating Price per Ton delivered at the Gas-Works, or alongside Gas-Works by the Calder and Hebble Canal, or at the Brighouse Railway Station, must be sent in on or before Friday, the 26th of July, 1901, addressed to the Town Clerk, Public Offices, Brighouse, endorsed on the outside "Tender for Coal" or "Lime," as the case may be.

The lowest or any Tender not necessarily accepted.

By order,
JAMES PARKINSON,
Town Clerk.

Town Clerk's Office, Brighouse,
July 10, 1901.

BROADSTAIRS GAS COMPANY.

THE Directors of the above Company invite TENDERS for the work and material required in the construction of a RETORT STACK and RETORT SETTINGS. Also SCOOP CHARGING APPARATUS; and the supply and erection of a complete ROOF over their Retort-House.

Specifications and Prints may be obtained on application to the undersigned, upon payment of One Guinea, which will be returned on receipt of a *bonâ-fide* Tender.

Tenders, addressed to the undersigned, to be sent in not later than July 22, 1901.

The Directors do not bind themselves to accept the lowest or any Tender.

F. HIGGINSON,
Engineer, Manager, and Secretary.

Gas Office, Alexandra Road,
Broadstairs.

BOROUGH OF DARLINGTON.
(GAS-WORKS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Gas and Electric Lighting Com-mittee invite TENDERS for the supply of either 15,000 or 30,000 Tons of freshly wrought GAS COAL, delivered at the Gas-Works Siding during the ensuing Six or Twelve Months as may be required.

Further Particulars may be obtained from Mr. Frank P. Tarratt, Gas-Works Engineer, Darlington.

Tenders, endorsed "Tender for Gas Coal," to be delivered at my Office, Houndgate, Darlington, not later than July 18.

No pledge is given that the lowest or any Tender will be accepted.

HENRY G. STEAVENSON,
Town Clerk.

Town Clerk's Office,
Darlington, July 9, 1901.

MOSSLEY CORPORATION.
(GAS DEPARTMENT.)

THE Gas Committee are prepared to receive TENDERS for the supply of clean, screened or unscreened, COAL and CANNEL, to be delivered at Carr Hill Sidings, L. & N.W. Railway, or the Gas-Works Wharf on the Huddersfield Canal, Mossley.

Forms of Tender and further Information can be obtained on application to Mr. H. J. Robinson, Engineer and Manager, Gas-Works, Mossley.

Tenders, stating Price per Ton, endorsed "Coal and Cannel," to be sent in not later than Monday, the 22nd inst., addressed to the Chairman of the Gas Committee.

The Committee do not bind themselves to accept the lowest or any Tender.

By order,
JOSEPH HYDE,
Town Clerk.

CITY OF BRADFORD.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Gas Committee of the Bradford Corporation are prepared to receive TENDERS for the supply of best GAS COAL, COBBLES, NUTS, and CANNEL, all to be well screened, dressed, and free from Shale and Pyrites, to be delivered at the several Works of the Corporation in the City during the period of Six, Nine, or Twelve Months, commencing on the 1st day of August next, as may be agreed upon.

Form of Tender, with any further Information required, may be had on application to Mr. Wood, Gas Engineer, Town Hall.

Sealed Tenders, endorsed "Tender for Coal," to be sent to me on or before Thursday, the 25th of July inst.

Persons tendering must give an assurance that they have paid to their Workmen for the Three Months preceding date of Tender not less than the minimum Standard Rate of Wages, and undertake to continue to pay during the Contract the said Rate of Wages.

The lowest or any Tender will not necessarily be accepted.

FREDERICK STEVENS,
Town Clerk.

Town Hall, Bradford,
July 12, 1901.

BOROUGH OF TORQUAY

ST. MARY CHURCH GAS-WORKS EXTENSIONS AND IMPROVEMENTS.

THE Corporation of Torquay are pre-pared to receive TENDERS for the execution of the under-mentioned WORKS, and for the supply and erection of the following PLANT, viz.:—

REMOVAL and REFIXING of STATION METER, WASHER, &c.
CHIMNEY.
RETORT-BENCH.
PIPE CONDENSERS.
EXHAUSTERS.
MECHANICAL WASHER-SCRUBBER.
PURIFIERS (elevated).

The whole of the Works to be carried out under the supervision and to the satisfaction of Mr. Francis Chalmers, Manager of the Gas-Works, who will supply any further Particulars required.

The Plans and Specifications may be seen, and copies of such Plans and Specifications, together with Form of Tender, obtained on application to the undersigned, on the deposit of Two Guineas, which will be returned on receipt of a *bonâ-fide* Tender upon the prescribed Form and within the stated time.

Should a Contractor withdraw his Tender, the amount of his Deposit will be forfeited.

Sealed Tenders, endorsed "Extensions and Improvements, St. Mary Church Gas-Works," must be delivered to the undersigned not later than noon on Tuesday, Aug. 6, 1901.

The Corporation do not bind themselves to accept the lowest or any Tender.

FREDK. S. HEX,
Town Clerk.

Town Hall, Torquay,
July 12, 1901.

SOUTHWARK AND VAUXHALL WATER COMPANY.

SALE BY TENDER OF THREE PER CENT. DEBENTURE STOCK.

NOTICE is Hereby Given, that it is the intention of the Directors of the Southwark and Vauxhall Water Company to SELL BY TENDER, to be received at the Company's Office, Southwark Bridge Road, S.E., not later than Twelve o'clock noon, on Tuesday, July 23, 1901, such an amount of DEBENTURE STOCK of the Company as will produce the sum of £69,182.

The Stock now for Sale is the balance of the Capital authorized by, and to be issued under, the Provisions of the Southwark and Vauxhall Water Act, 1894, and will be entitled from Aug. 31, 1901, to interest at the rate of £3 per cent. per annum. It will be known as Debenture Stock "B;" and may be redeemed at par at any time after the expiration of 25 years from the date of issue, subject to Six Months' previous notice of the intention to redeem. Debenture Stock "B" will rank for Interest and otherwise *pari passu* with the other Debenture Stock of the Company, but before the Ordinary and Preference Stock and Share Capital. It is a lawful investment for Trustees.

For Particulars, Forms, and Conditions of Tender, apply at the Office of the Company, Southwark Bridge Road, London, S.E.

By order of the Board of Directors,
MONTAGUE WATTS,
Secretary.

July 13, 1901.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTHEND GAS COMPANY.

£5000 NEW ORDINARY STOCK
AND
£5500 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, July 30, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Executors of J. W. FOX, Esq., deceased, and other Owners.

GAS AND WATER STOCKS AND SHARES
IN THE
CRAYS GAS COMPANY,
BROMLEY GAS CONSUMERS' COMPANY,
SOUTH-WEST SUBURBAN WATER COMPANY.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, July 30, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

YEADON AND GUISELEY GASLIGHT AND COKE COMPANY.

ISSUE OF £2000 ORDINARY NEW "B" STOCK.

THE Directors invite Tenders for the whole or any part of £2000 ORDINARY NEW "B" STOCK of the said Yeadon and Guiseley Gaslight and Coke Company, being a portion of the additional Capital of £30,000 authorized to be raised by the Yeadon and Guiseley Gas Act, 1880.

The Sliding-Scale has been applied to the Capital of the said Company by the Yeadon and Guiseley Gas Act, 1899, and under such Act the above-mentioned Stock will be entitled to a Standard Dividend of 7 per cent., provided the Standard Price fixed by the said Act of 3s. per 1000 cubic feet is charged for Gas by the Company. The said Act contains provisions for the increase or decrease of the said Standard Rate of Dividend in the event of the price charged for Gas by the Company being below or above the said Standard Price.

Prior to the application of the Sliding-Scale by the said Yeadon and Guiseley Gas Act, 1899, the Company were authorized to pay Maximum Dividends of 10 per cent. on the "A" Stock and 7 per cent. on the "B" Stock, and to charge a maximum price of 5s. per 1000 cubic feet for Gas. The Company for many years past paid the Maximum Rates of Dividends, and during several Years charged the net Price of 2s. 8½d. per 1000 cubic feet for Gas. Owing to the great rise in the price of Coal last Year, the Company charged a net price of 3s. per 1000 cubic feet for Gas; but they hope to be able shortly to reduce the Price again.

The Directors invite Tenders for the whole of the said Stock or for any portion thereof not less than £10 or any multiple of £10, subject to the Provisions of the Yeadon and Guiseley Gas Acts, 1868 to 1899, and to the Conditions of Sale.

Tenders must be sent in on or before Wednesday, the 31st day of July, 1901.

Forms of Tender, with Particulars and Conditions of Sale, may be obtained on application to the Secretary of the Company at the Gas-Works, Yeadon, near Leeds, or to

WATSON, SON, AND SMITH,
Solicitors for the Company.
11, Cheapside, Bradford.

THE SILICA FIRE-BRICK COMPANY,
OUGHTIBRIDGE, near SHEFFIELD,
MANUFACTURE
SILICA BLOCKS, BRICKS, AND CEMENT
OF SUPERIOR QUALITY
FOR GAS-FURNACES.
Trade Mark: "SILICA."
These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their
GREATER DURABILITY,
Strongly recommended where EXCESSIVE HEATS have to be maintained.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.
Prices and Analysis of all the Scotch Cannels on Application.

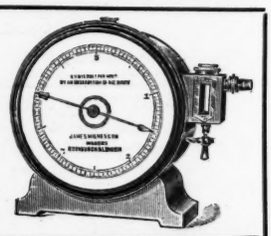
THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.
GAS ENGINEERS' AGENTS AND CONTRACTORS FOR
Meters, Fire-Clay Goods, Oxide of Iron, and all other Gas Apparatus. Retort Carbon purchased.
Inquiries Solicited.
Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

COKE-BREAKERS,
PRICES REDUCED.
(THOMAS & SOMERVILLE'S PATENT)
With Elevators and Conveyors worked by Steam or Gas Engine.
GEORGE WALLER & CO.,
165, QUEEN VICTORIA STREET, E.C.;
And at STROUD, GLOUCESTERSHIRE.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.
QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

HYDRAULIC BLOWER
For blowing Air into Gas Purifiers for the purpose of
REVIVIFYING THE FOULED OXIDE.
Full Particulars on application.
LUXWERKE LUDWIGSHAFEN AM RHEIN.

JAMES MILNE & SON, LTD.,
GAS ENGINEERS
MILTON HOUSE WORKS EDINBURGH.
LONDON. —— LEEDS. —— GLASGOW.



INCLINED RETORTS.
HORIZONTAL RETORTS.
RETORT BENCHES AND SETTINGS,
WITH
GENERATOR OR REGENERATOR FURNACES.
W. J. JENKINS & CO., Ltd., RETFORD.

TROTTER, HAINES, & CORBETT, LIMITED,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: R. CULL, 84, OLD BROAD STREET, E.C.

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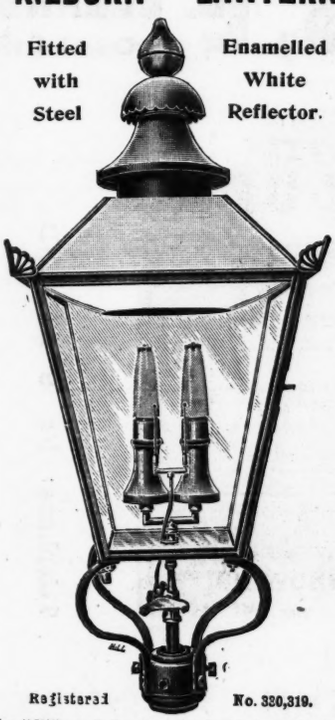
Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

HARDMAN & HOLDEN, LD.
ESTABLISHED 1820.
SULPHURIC ACID.
MADE from Spent Oxide (free from Arsenic) and of excellent Purity. Specially prepared for Sulphate of Ammonia Manufacturers.
Works: BLACKBURN; Miles Platting and Clayton, MANCHESTER.
Head Office: Miles Platting, MANCHESTER.
Inquiries Solicited.

THE
"KILBURN" LANTERN.
Fitted with Steel
Enamelled White Reflector.



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The "Kilburn" Lantern (for double lights) and the "St. Albans" Lantern have been adopted for lighting the Town of St. Helens.

H. GREENE & SONS, LTD.
Works and Show Rooms:
19, Farringdon Road, E.C.
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Telephone: 2669 AVENUE. Telegrams: "LUMINOSITY."

NITRATE of Thorium and Cerium.
FABRIK CHEMISCHER PRAEPARATE VON STHAMER, NOACK, AND CO., HAMBURG.

DISPENSE WITH CANNEL COAL
and
INCREASE YOUR ILLUMINATING POWER
by using the
WHESSOE-MUNICH BENZOL CARBURETTER
The Cheapest and Best in the Market.
The Managers of Tynemouth, Middlesbrough, and Darlington Gas-Works are much pleased with it, and would not be without it.
Apply to the Sole Makers:
THE WHESSOE FOUNDRY COMPANY, LIMITED, DARLINGTON.

EVESON FOR COAL
ANOTHER REMINDER!
TELEGRAMS: "EVESON, BIRMINGHAM."

PREPAYMENT ATTACHMENTS
AND
ALL PARTS FOR GAS & WATER METERS.
Quotations to Samples.
THE
Tourtel Manufacturing Co., Ltd.,
146A, QUEEN VICTORIA STREET, E.C.
Can undertake the Largest Contracts.

JAMES OAKES & CO.
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.,
Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts and Covers, and rendering Leakage impossible.

THOMAS TURTON
AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
LONDON OFFICE:
90, CANNON STREET, E.C.

PRICE'S COKE & COAL BARROW

effects a great saving of time, labour, and expense.
For Particulars Price, &c., apply to Mr. EDWARD PRICE, "Langley," Wyke Avenue, WORTHING.
Prices are Reduced.

HEATHCOTE GAS COAL.
Rich in Illuminating Power and Yield of Gas.
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.
THE GRASSMOOR CO., LD.,
CHESTERFIELD.

WELDON MUD
FOR
GAS PURIFICATION.
For use in the
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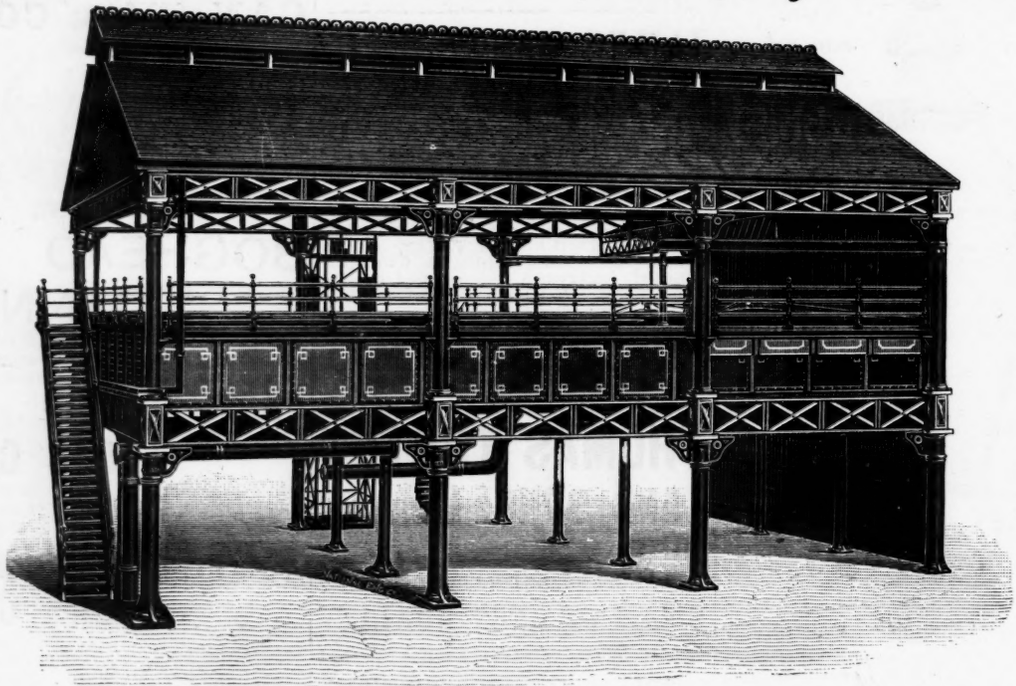

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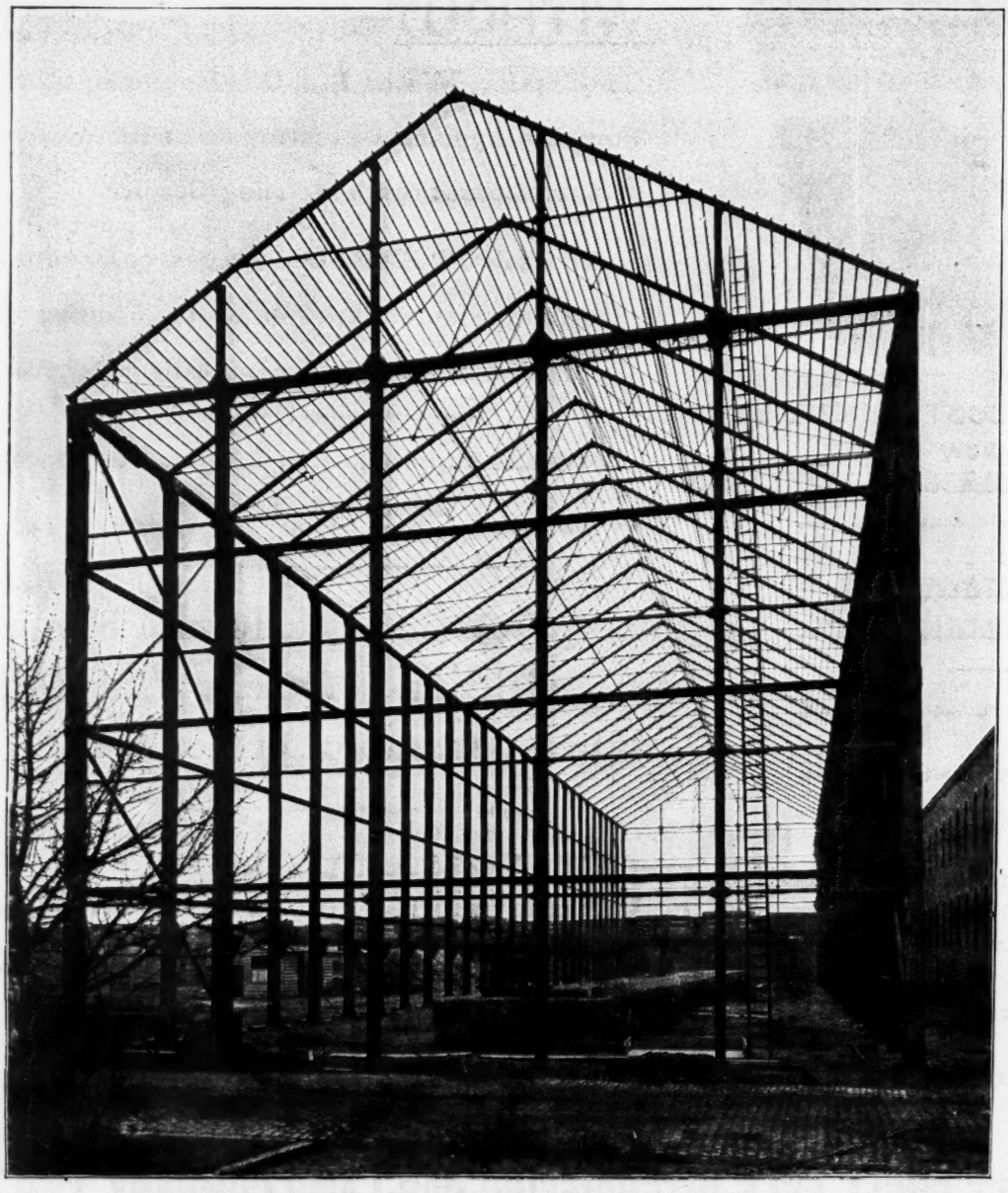

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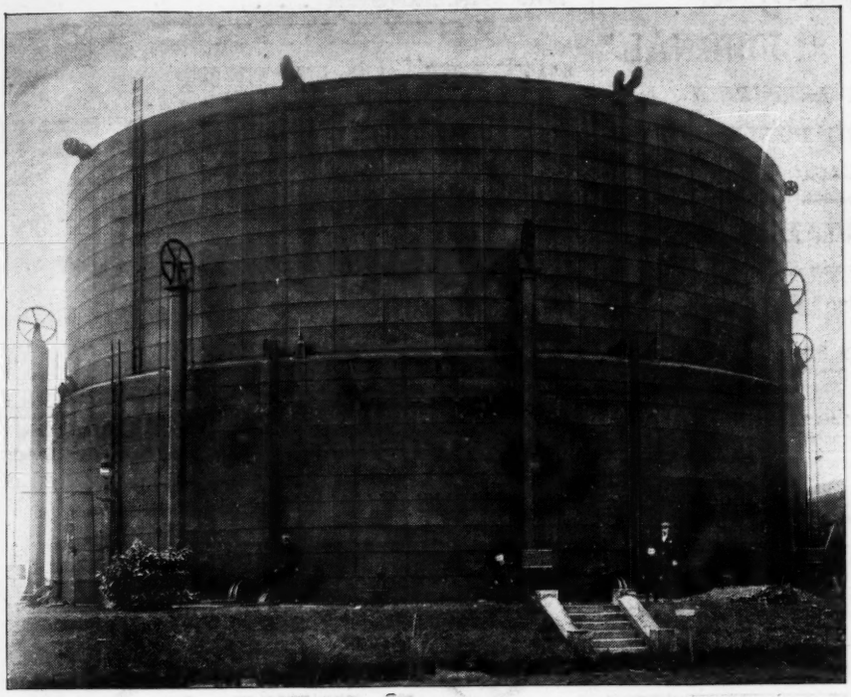

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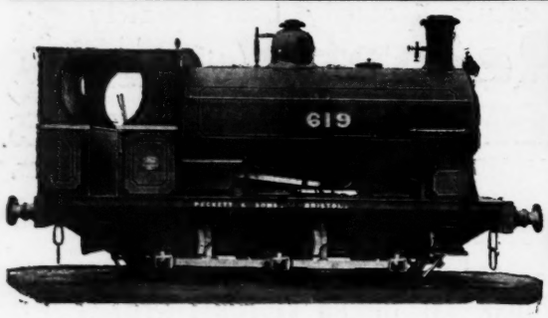

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IT IS 300 FT DIAM. HAS SIX LIFTS, EACH 30 FT DEEP. HAS NO ROPES OR SPIRAL GUIDES.
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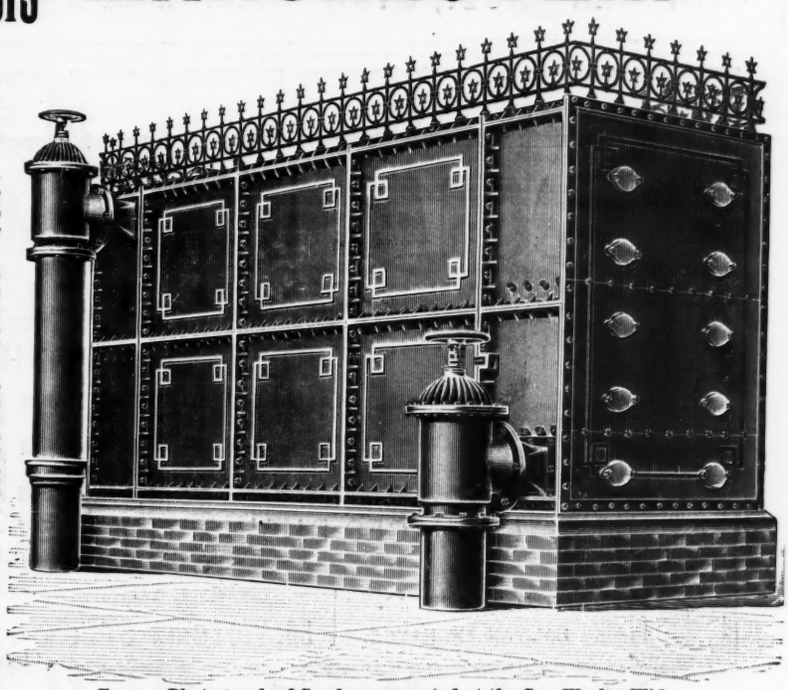
R. & J. DEMPSTER, LTD., recommend this Condenser to be used as a Finishing Condenser, after the gas has already passed through the ordinary Annular or Air Condensers.

Condensers of this type equal to 10,500,000 cubic feet per 24 hours already erected and at work.



From a Photograph of Condenser erected at the Gas-Works, Widnes.
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